

BOMBAY PRESIDENCY
INDIAN IRRIGATION COMMISSION.

MINUTES OF EVIDENCE.



THE IRRIGATION COMMISSION OF 1901-02.

BOMBAY PRESIDENCY.

COL. SIR COLIN SCOTT-MONCRIEFF, K.C.M.G., C.S.I. (*President.*)

Hon'ble Mr. DENZIL C. J. IBBETSON, C.S.I., I.C.S.
Mr. T. HIGHAM, C.I.E.

Hon'ble Mr. P. RAJARATNA MUDALIYAR, C.
Hon'ble Mr. J. W. MUIR MACKENZIE I.C.S.
porary Member for Bombay.)

MR. W. B. GORDON, (*Secretary.*)



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BOMBAY PRESIDENCY.

FIFTH DAY.

Sukkur, 5th November 1901.

Replies to written enquiries, laid before the Commission by Mr. E. F. Dawson,
Superintending Engineer.

Question No. 1. Area irrigated during the last 10 years in Sind, including both Divisions.

Canals and Bunde.	ACTUAL IRRIGATION.										Average.	Area commanded.
	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-00.		
MAJOR WORKS.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
Desert Canal . . .	124,819	60,130	65,154	89,564	163,464	95,332	107,778	129,236	104,887	125,588	103,609	442,245
Unhar Wah . . .	20,690	19,233	21,277	52,634	57,318	62,663	85,601	78,666	72,864	76,041	12,864	214,055
Begari Canal . . .	144,053	174,719	192,524	207,393	211,433	183,393	199,851	258,932	254,723	259,025	206,464	680,521
Eastern Nara System.	228,392	211,951	243,413	233,803	234,795	190,041	236,607	239,538	210,291	335,409	219,514	(a) 1,152,170
	617,954	460,083	554,369	568,468	607,035	531,726	630,037	758,522	688,651	798,663	610,473	2,468,992
MINOR WORKS.												
Works for which Capital and Revenue Accounts are kept.												
Sukkur Canal . . .	67,199	89,313	88,768	95,806	123,040	73,325	85,023	81,659	73,778	73,208	68,308	124,560
Ghar Canal . . .	233,114	239,869	265,563	258,064	261,477	144,752	283,373	261,765	198,444	216,821	231,333	890,432
Mahrab Wah . . .	13,325	13,367	11,261	13,795	14,427	13,073	12,327	19,607	12,751	12,708	13,058	(a) 78,000
Alibhar Kacheri . . .	9,525	10,823	10,972	12,224	11,314	13,655	11,384	12,235	11,011	9,110	11,105	(a) 56,800
Great Marak . . .	40,421	64,111	68,788	61,363	61,846	65,380	69,160	67,793	63,601	60,929	60,851	(a) 277,900
Barkhan . . .	27,614	27,124	29,770	31,338	33,157	32,097	31,326	34,183	31,635	27,947	30,732	(a) 203,000
Fuleli Canal . . .	332,765	324,945	331,974	334,239	331,479	333,030	365,260	378,951	373,994	361,693	348,787	(a) 1,577,000
	772,863	759,071	767,064	807,479	842,740	673,312	806,703	843,123	789,017	764,317	782,169	2,746,192
Works for which only Revenue Accounts are kept.												
Canals in Shikarpur District . . .	130,289	145,509	199,655	183,883	224,881	129,790	152,178	230,591	190,050	179,771	176,955	416,570
Western Nara District . . .	207,328	206,938	239,179	210,069	266,208	170,661	225,913	255,642	209,674	215,381	219,719	453,268
Other canals in Western Nara District . . .	53,276	56,780	79,746	66,882	72,996	46,844	63,131	63,172	49,793	66,029	158,845	175,841
Canals and bunds in Karaohi Canals District . . .	203,711	198,680	194,732	195,237	213,826	186,846	201,549	241,056	215,840	216,323	206,998	568,145
Other canals in N. H. District . . .	311,179	303,186	321,625	333,336	351,606	310,767	321,609	189,153	144,677	146,963	318,255	(a) 2,379,431
Other canals in C. H. District . . .								157,875	147,201	187,166		
Other canals in Fuleli Canals District . . .	20,314	20,837	19,490	17,869	19,354	19,093	23,466	25,076	23,814	24,691	21,298	(a) 99,600
	808,097	936,760	1,054,528	977,268	1,138,571	869,816	1,018,849	1,166,455	981,049	977,520	1,002,163	3,937,855
AGRICULTURAL WORKS.												
Bunde in Left Bank Division . . .	4,559	5,717	3,094	43,043	47,371	29,193	42,787	45,894	17,335	18,535	25,528	97,599
GRAND TOTAL, SIND . . .	2,203,473	2,165,631	2,399,065	2,386,277	2,635,726	2,076,777	2,497,356	2,806,084	2,466,052	2,556,923	2,420,335	9,330,639

Left Bank Division.—Note 1.—There is no cultivation in the I. L. B. Division on works for which neither Capital nor Revenue accounts are kept.
Note 2.—Culturable area and area irrigable by complete system, and at present, are given at page 132 of the Revenue Report for 1899-1900.

(a) Irrigable area per year is calculated at one-third.
(b) Does not include the Jamrao area.

Question No. 2. Area cultivated in Sind for the last 10 years, showing Proportion of Flow to Lift Irrigation.

Year.	AREA CULTIVATED.			PERCENTAGE OF LIFT AND FLOW.		
	Lift.	Flow.	Total.	Lift.	Flow.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.	Acres.
1890-91 .	610,860	1,344,289	1,955,149	31	69	100
1891-92 .	698,144	1,492,665	2,190,809	32	68	100
1892-93 .	745,540	1,716,514	2,462,054	30	70	100
1893-94 .	807,448	1,949,280	2,756,728	29	71	100
1894-95 .	693,513	2,190,461	2,883,974	24	76	100
1895-96 .	666,786	1,551,598	2,218,384	30	70	100
1896-97 .	704,423	1,946,332	2,650,755	27	73	100
1897-98 .	681,202	2,359,865	3,041,067	22	78	100
1898-99 .	677,214	2,000,098	2,677,312	25	75	100
1899-1900	714,707	2,057,195	2,771,902	26	74	110

Note.—The above areas include Government, Jagir and Dubari.

Questions Nos. 3 and 4. Statement showing irrigated Area, consolidated Assessment thereon, and Remissions in Sind for 20 years, commencing with 1880-81, as compared with variations in Bukkar Gauge.

Year.	Area irrigated.	Consolidated Assessment.	Remissions.	BUKKAR GAUGE.		
				Over 10'	Over 12'	Over 13'
	Acres.	Rs.	Rs.			
1880-81 .	1,492,669	32,78,173	64,757	85	60	46
1881-82 .	1,601,986	36,01,294	34,852	98	76	41
1882-83 .	1,673,293	38,83,315	2,11,706	108	99	79
1883-84 .	1,540,831	36,99,141	93,379	91	53	31
1884-85 .	1,783,173	41,88,316	1,12,048	110	79	53
1885-86 .	1,739,919	40,75,152	1,56,416	98	72	58
1886-87 .	1,814,650	42,57,913	1,36,419	96	79	54
1887-88 .	1,871,114	43,07,913	61,937	73	57	45
1888-89 .	2,118,635	49,36,708	63,945	91	58	30
1889-90 .	2,349,819	54,77,205	2,32,992	88	81	76
1890-91 .	2,263,473	52,31,800	67,845	88	63	37
1891-92 .	2,165,631	52,64,210	1,53,999	83	44	30
1892-93 .	2,399,065	58,33,753	2,71,130	59	44	38
1893-94 .	2,386,277	58,45,378	1,84,997	86	57	44
1894-95 .	2,635,726	64,88,925	3,54,006	97	90	80
1895-96 .	2,096,777	49,82,340	2,79,593	85	41	25
1896-97 .	2,497,356	60,98,530	1,43,014	82	65	49
1897-98 .	2,806,083	69,27,951	2,43,063	92	66	57
1898-99 .	2,456,052	61,85,221	2,08,555	96	42	5
1899-1900	2,563,503	64,10,030	5,59,316	73	30	8

Question No. 5. Areas that might be brought under irrigation by proposed extensions of existing Canals or by the construction of new ones in the Province of Sind.

Canals.	Culturable Area commanded.	Area commanded by sanctioned Projects.	Area commanded by proposed Extensions.	Total.
RIGHT BANK DIVISION.				
Begari Canals District				
Desert Canal	442,245	...	...	442,245
Unhar Wah	214,056	...	...	214,056
Begari Canal	680,521	...	71,159	751,680
Kashmor Bund	34,387	...	...	34,387
	1,371,209	...	71,159	1,442,368
Shikarpur Canals District				
Canals in Rohri	195,770	(a) 120,594	1,200	317,564
Sind Canal	169,114	...	...	169,114
Rajib Canal	12,600	...	...	12,600
Chiti Canal	15,000	...	...	15,000
Garang Canal	9,000	...	...	9,000
Kusimpur Bund	800	...	...	800
Sukkur-Begari Bund	46,400	...	...	46,400
	448,684	120,594	1,200	570,478
Ghar Canals District				
Sukkur Canal	192,207	...	90,000	282,207
Ghar Canal	457,563	...	275,000	732,566
Ghar Bunds	7,643	...	...	7,643
	657,416	...	365,000	1,022,416
Western Nara District				
Canals in Western Nara District	637,469	...	91,893	729,362
Karachi Canals District				
Canals in Karachi District	563,145	...	35,000	598,145
TOTAL RIGHT BANK DIVISION				
	3,677,923	120,594	564,252	4,362,769

(a) Mahi Wah.

5. Areas that might be brought under irrigation by proposed extensions, etc.—conold.

Canals.	Culturable Area commanded.	Area commanded by sanctioned Projects.	Area commanded by proposed Extensions.	Total.
LEFT BANK DIVISION.				
Northern Hyderabad Canals District	Mohrab 78,000 Other Canals 1,424,663 Dad Nasrat Naulakhi . . . . .	... ... 884,179 272,243 189,350	... ... ... ... ...	78,000 1,424,663 884,179 272,243 189,350
Central Hyderabad Canals Districts	Ali Bahar Kacheri 56,300 Marak 277,900 Sarfraz 202,000 Other Canals 854,768 Ren Wah Project Gharo Mahmuda Project Khobhar Wah . . . . .	... ... ... ... ... ...	... ... ... ... 61,370 45,821 30,000	56,300 277,900 202,000 854,768 61,370 45,821 30,000
Fuleli Canals District	Fuleli Canals 1,577,000 Other Canals 99,600 Hasan Ali Wah Gaga Pandi Wah . . . . .	... ... 101,649 ... ...	... ... ... ... 7,000	1,577,000 99,600 101,649 ... 7,000
Eastern Nara District	Nara Supply Channel 6,070 Eastern Nara 275,500 Mithrao 599,800 Dim Wah 52,000 Heran 9,000 Khipra 45,000 Thar 144,800 Hirai Wah Jamrao Canal . . . . .	... ... ... ... ... ... ... ... ...	... ... ... ... ... ... ... ... ...	6,070 275,500 599,800 52,000 9,000 45,000 144,800 ... 770,000
Jamrao Canal District, Jamrao	Jamrao Canal 770,000	50,237	...	50,237 770,000
TOTAL LEFT BANK DIVISION	6,472,401	997,658	144,191	7,614,250
Grand Total	10,150,324	1,118,252	708,443	11,977,019

Question No. 6. Relation of the total irrigated Area to total cultivable Area in the Province of Sind.

Districts.	Total irrigated Area.	Total cultivable Area.	Percentage.
	Acres.	Acres.	Acres.
<i>Indus Right Bank Division.</i>			
Begari Canals District	368,905	6,555,276	21
Shikarpur Canals District	192,682		
Ghar Canals District	322,648		
Western Nara District	281,484		
Karachi Canals District	206,998		
TOTAL	1,372,717	6,555,276	21
<i>Indus Left Bank Division.</i>			
Eastern Nara District	245,544	5,679,690	18.45
Northern Hyderabad Canals District	493,996		
Central Hyderabad Canals District			
Fuleli Canals District	368,080		
TOTAL	1,047,620	5,679,690	18.45
TOTAL, SIND	2,420,337*	12,234,966†	19.78

* Average of last ten years.

	Acres.	
† Khelat	318,980	6,555,276
Upper Sind Frontier	1,214,356	
Shikarpur Collectorate	3,820,869	
Karachi Collectorate	1,201,671	
Thar and Parkar	1,436,444	5,679,690
Hyderabad	4,243,246	
TOTAL SIND		12,234,966

Question No. 8. Canals which are ordinarily able to obtain a perennial or cold weather supply are the following:—

- Eastern Nara system, omitting Khipro Canal
- (1) Fuleli Canal.
 - (2) Jamrao Canal, including Dim.
 - (3) Mithrao.
 - (4) Thar.
 - (5) Eastern Nara.
 - (6) Heran Wah.
 - (7) Sukkur Canal.

Question No. 9. Extent to which the supplies to the canals have been affected, if at all, by the withdrawals for new canals in the Punjab.

MR. H. G. PALLISER, CHIEF ENGINEER, INDUS RIGHT BANK DIVISION.

I cannot find any evidence of the canals in this Division having been prejudicially affected by withdrawals for the new canals of the Punjab. The question would, of course, only arise with respect to the rabi or cold weather discharges, which unfortunately have not been gauged in Sind, except for the last two years by the Indus River District, so that no definite information is forthcoming by which the cold weather supplies of the river can be compared before and after the opening of the new Punjab Canals and one or two I believe, in Bahawalpur.

2. I am inclined to doubt whether our rabi supply to the Sukkur Canal has been practically affected up to date by Punjab withdrawals, but it is of course obvious that there must be a limit, and that any further extensive draw-off above Sind might materially diminish our cold weather supply and diminish our revenue.

MR. E. F. DAWSON, SUPERINTENDING ENGINEER, INDUS LEFT BANK DIVISION.

So far as can at present be ascertained, the canals in the Indus Left Bank Division have in no way been affected by the withdrawals for new canals in the Punjab.

Extract from letter No. 01394 I., dated 11th October 1901, from the Secretary to Government, Punjab, to the Commissioner in Sind.

Canals in the Punjab on the Indus and its branches, which have been constructed and opened in the last 20 years with the full supply of each :—

Name of River.	Nature of Canal.	Name of Canal.	Full Supply.	Date of Opening.
			Cusecs	
Sutlej	Perennial	Sirhind Canal.	8,000	24th November 1882.
...	Inundation	Lower Sohag and Para.	1,400	Kharif 1885.
Chenab	Perennial	Chenab Canal.	10,730	March 1892.
Jhelum	Perennial	Jhelum Canal.	8,800	To be opened on 80th October 1901.
...	Inundation	New Sahiwal Canal.	1,100	Enlarged in 1889.
Ravi	Inundation, but provided with a weir on the Ravi.	Sidhnai.	2,385	27th May 1886.
Beas	...	Nil.		
Indus	...	Nil.		
Swat	Perennial	Swat River.	775	12th February 1885.

Question No. 10. Necessity for (11) benefits to be derived from, and (12) practicability of constructing a weir at Bukkur near Sukkur.

MR. H. G. PALLISER, CHIEF ENGINEER.

The reply to enquiry No. 10. whether the necessity for a weir at Bukkur, as proposed by Sir Evan James, has been felt, is in the negative.

And to No. 11, the Sukkur Canal and possibly the Sind and Ghar Canals would be benefited by the construction of such a weir.

Question No. 13. Do the results so far attained on the Jamrao Canal indicate that it will be as successful, and that it will irrigate as large an area as anticipated in the revised estimate ?

MR. E. F. DAWSON, Superintending Engineer.

The results so far attained on the Jamrao Canal indicate that it will be as successful and that it will irrigate as large an area as anticipated in the revised estimate, viz., 258,000 acres a year. Though in the Southern District, Jamrao Canal, all the water-courses have not been completed, and nearly half the area of the land under command in that portion still remains to be given out for cultivation, with the canal running only two-thirds full, the revenue during 1900-01, the first full year of the working of the canal, exceeds that of the estimate (Rs. 3,95,546) for the seventh year of its working by nearly Rs. 20,000, while the area (178,137 acres), vide Statement G, differs very little from that estimated (178,750 acres) for the seventh year, and in a few years more will even exceed the estimate to probably a great extent.

Question No. 14. Statement showing Lands irrigated in 1900-01 from private Canals which are not under the control of the Public Works Department.

District.	Government Lands.			Inam Lands.			Grand Total.		
	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.
Karachi	16,080	5,378	21,458	252	17	269	16,332	5,395	21,727
Hyderabad	5,834	1,952	7,786	900	127	1,027	6,734	2,073	8,813
Shikarpur.	18,009	14,306	32,315	2,880	6,189	9,179	20,999	20,495	41,494
TOTAL	39,923	21,636	61,559	4,142	6,333	10,475	44,065	27,969	72,034

Question No. 15. Generally, what scope is there for extensions of irrigation in Sind, including Khelat or other foreign territory, and in what order should they be considered ?

MR. E. F. DAWSON, Superintending Engineer, Indus Left Bank Division.

There is no further scope of financially successful cultivation in the Northern and Central Hyderabad Canals Districts, but in the Fuleli and Eastern Nara Districts there are, however, large tracts of uncultivated waste which might be brought under irrigation, but nothing definite can be said till the contour survey of the Fuleli District, which has now been commenced, is completed, and the Eastern Nara District is thoroughly surveyed. The extension of irrigation, however, depends on outside colonists, as the area at present cultivated in this Division is more than sufficient for the labour available from the present population.

Memoranda by Witnesses.

NO. I.—PRELIMINARY NOTE ON THE PROPOSED BUKKUR WEIR BY MR. E. F. DAWSON.

With reference to the questions asked about a Bukkur weir, I am still not in a position to say whether it is practicable or not. Enquiries are, however, proceeding, and I hope to know more about the site before the Commission reach Sukkur next month.

In the meantime, enquiries should proceed regarding possible increase in revenue, if the weir is practicable and is ever built. Very approximate figures will suffice in order to enable us and the Irrigation Commission to decide whether the scheme is worth proper investigation. That is all that is proposed now. I am not proposing a weir yet. This is merely our preliminary enquiry to get some idea of the revenue reasonably to be expected and the return it would yield on the probable costs.

For the present then, let us assume the weir is practicable, that there will be no practicable engineering difficulties which cannot be overcome. I will, in the course of the next week or so, have completed an estimate of approximate figures of cost.

Meantime, to form any opinion of the return the project should give, it would help if the revenue were considered. Messrs. Rieu and Tupper should be able to assist. The Commissioner's knowledge of the country is, I understand, also considerable.

The work under consideration is a low weir of solid masonry on which to construct falling gates. With gates up we would have the water in the river at Sukkur always standing at or above 12.5 ft. on the Bukkur gauge. In the flood season, the gates—a part of them—would be dropped, and we would always maintain the river at the present average height of Bukkur or above it—something over 13 ft. on Bukkur,—and maximum floods might rise to 21 or even 22 ft. Bukkur as compared with the present maximum of 18 ft. Of course bunds, etc., will be raised to stand this increased flood height. The danger this might expose us to will be considered hereafter, but please neglect it for the present. We are assuming the scheme as practicable just now.

Here, then, are the conditions for the purpose of revenue estimate.

A 12-ft. weir at Bukkur will have effect as follows on the Sind Wah :—

When now, on about 10th May, we get a foot of water on the sill of the canal, the weir will raise the level to 1'68. (Trivial.)

On 1st June, in average years, we have 3'50 ft. on the Sind Wah gauge. With the weir, it will be increased to 4'90—say, 5-ft. (Important increase.)

On 28th June, we have now 6-ft. With weir, this will be increased to 8-ft. (Important increase.)

The weir will render us practically independent of changes in the mouth of the Sind Wah. It will not, however, increase the supply in July and August: the present supply would be maintained then. Little more can be said than this.

The early supply would be assured, and supply in July and August remain practically unaltered.

The weir will convert the Sukkur Canal, into a perennial canal, and have an excellent supply throughout the whole year.

A new head from above the weir to the Ghar will convert the Ghar into a perennial canal. It might take a line somewhat as shown on the accompanying tracing, and would not only give water to a large tract which has suffered of late years, but would render the Ghar practically independent of changes in the river at the mouth of the Ghar, and should suffice for an area much in excess of any area ever yet cultivated.

NO. II.—NOTE BY MR. DAWSON ON THE PROPOSED WEIR AT SUKKUR.

Three questions, Nos. 10, 11, and 12, have been asked concerning a weir at Bukkur. I take No. 11 first.

11.—“What canals would be benefited by the construction of such a Weir, and to what extent?”

The Ghar, Sukkur, and Sind Canals on the right bank and the whole Jamrao and Eastern Nara systems on the left bank would be benefited. With a weir at Sukkur, it will probably also be advisable to re-consider a project for a better supply to the Khairpur State and the Hyderabad District, Mr. Joyner's Hyderabad Canals project having been condemned partly because the water was carried for a great distance at a considerable depth below the surface of the ground.

2. With a weir at Sukkur, the Ghar and Sukkur Canals (with a new feeder to the former from above the weir) would be converted into perennial canals, and be rendered capable of annually irrigating a combined area of kharif and rabi at least equal to, if not considerably greater than, the sum of the greatest kharif and rabi areas ever yet irrigated. The Sind Wah, being nearly 80 miles up river, would be only slightly improved, but there is no doubt that it would be improved to the extent of having a better early supply and also a somewhat better late supply than at present.

3. The present supply to the Jamrao and Eastern Nara systems is taken off from the river above Bukkur through the Nara Supply Channel and is ample for requirements, except, perhaps, in a low river. It was deepened in 1892 and is supposed to be sufficient, but from the fact that kharif crops on the Jamrao are now being irrigated by rotation in this the second year of cultivation under the Jamrao, it may not unreasonably be concluded that a limit to extensions on the Jamrao and Eastern Nara systems will soon be reached. The Jamrao is, however, already irrigating nearly the full duty of the water it can carry, so that there is no fear that the present supply channel is not capable of fulfilling its intentions; but if floods can be cut off from the Eastern Nara Valley, there is room for considerable extension of cultivation there, and, were a weir constructed at Sukkur, the whole of this area and that under the Jamrao would be rendered independent of fluctuations in the height of the river supply.

4. The increase in revenue these improvements will yield is a question for careful enquiry. It may possibly be roughly estimated by the Revenue officials without much difficulty for the right bank of the river, and the Commissioner in Sind will, perhaps, be able to answer the question before the Irrigation Commission visit Sukkur, but it may safely be said that it will amount to lakhs of rupees on the Sind, Sukkur and Ghar Canals alone; and, even neglecting the left bank improvements altogether, it

appears at first sight, at any rate, that a project for the weir is worth investigating further.

5. I take question 10 next.

10.—“Has the necessity for a Weir at Bukkur as proposed by Sir Evan James been felt?”

The Ghar and Sukkur Canals, two of our most important revenue-yielders in Sind, have for years shown great fluctuations in irrigated areas consequent on variation of heights of water in the river at different seasons of the year, and the Ghar has suffered also particularly of late years from changes in the dhand supply where it takes off from the river. Indeed, complaints have been so loud and real, especially as regards the higher areas near the mouth of the canal, that the Irrigation Department contemplate undertaking a survey with the object of completely remodelling the canal. Though, however, large additional areas may be brought under cultivation by a re-modelled canal, it is rather improbable that the higher lands near the mouth of the Ghar will receive benefit from such a scheme so long as a mouth is taken direct from the river any where below Sukkur. Even a mouth from above Sukkur would not appreciably improve the present conditions, as the natural levels do not permit of it, unless a weir be constructed to raise the supply level at the head, and the only way in which the higher lands of the Ghar can be made independent of the changes at the mouth and of unfavourable falls in heights of the river is by the construction of such a weir.

6. In so far, then, as improvement in the supply has been known to be desirable on both the Sukkur and Ghar Canals, the necessity for a weir at Bukkur seems to have been recognised for years. Indeed, so long ago as 1855, Lieutenant Fife, R.E., proposed taking off a new head from above Sukkur for the Ghar Canal, but it would appear that the over-worked Engineers in Sind have never had time to spare for the investigation of a project for a weir, and the site has, I believe, generally been supposed to be extremely unsuitable and difficult, if not impossible, for that object. I have more than once been informed that there was a hole in the river bed of the Rohri gorge which has never been bottomed by soundings. This brings me to question No. 12.

7. 12.—“Have any investigations been made to show the practicability of such a Weir?”

8. Last season, Mr. Corbett, Executive Engineer, Indus River District, and I sounded the Rohri side channel from a launch, and seemed to find bottom all the way through it, the deepest sounding recorded being 68 feet, and a few soundings taken across the channel above the gorge apparently gave rock bottom at depths in most places less than 30 feet and in many places only a few feet below low-water level. Further investigation could not be made before the inundation season, and it was postponed until this cold weather. I have now had a hurried cross section taken on a line between the heads of the Sukkur Canal and Nara Supply Channel and attach herewith plan and section, sheet No. 1, showing results. There has been no time for reliable borings to be made, and the bottom rock has been found merely by sounding and by probing with an iron shod bamboo and with a long iron bar under difficult conditions, with the river 6 feet on the gauge, so the depths shown may be somewhat inaccurate; but there seems no doubt that rock can be found on this line at approximate depths given on the cross section, which are soundings below a stage of 6 feet on the Bukkur gauge. There is uncertainty about parts of the section shown dotted.

9. Much more favourable conditions may exist—the deep hole shown on the section may die out a few hundred feet up-stream; but without a complete survey of the bed of the river for some hundreds of feet up and down stream, there can be no certainty of this, and I therefore propose at this stage of the enquiry to assume that the section is as plotted.

10. Starting from the Sukkur side, we find rock at depths of from 1 to 8½ feet below the zero of the Bukkur gauge for a distance of 2,400 feet; from 8½ feet at 2,400, it drops to about 36 feet at chainage 2,600; and from 3,100 it rises to 9 feet at 3,300; and onwards it gradually rises until the Bukkur zero is met at chainage 4,600. With the exception of the deep portion between 2,400 and 3,300, there would be no serious difficulty in putting in the foundations for a weir, although parts of it might have to be done under compressed air in suitable caissons. But

whether the 900 feet length in deeper water could also be satisfactorily dealt with is a question for more serious consideration.

11. Before discussing this point, however, I propose to briefly review the whole project. There are difficulties attending it which are inter-dependent with the weir design.

12. For the present, let us assume that foundations can be laid on this site and that we can construct on them a solid weir up to 3 feet on the Bukkur gauge. Above this, we will provide a weir or dam fitted with suitable openings (regulated by gates) for the passage of floods.

13. The calculations to find the effect of the weir on low and high river water levels involve fixing data regarding height at which certain discharges occur, their sectional areas, velocities, etc., all of which are given in the attached "Calculations." All of the important data have been obtained from results of discharges measured in the last two years and from gauge heights of which we have a record for over 40 years to refer to. The lowest discharge for calculation purposes has been taken at 50,000 cubic feet per second and the highest at 800,000 cubic feet per second. The latter is supposed to occur without a weir at 18 feet on the Bukkur gauge, a height which has never been realised; and although the discharge at such a height might quite possibly exceed even 800,000, it will not seriously affect the design, the height at which the maximum flood is fixed being the important feature for that purpose.

14. The calculations show, with weir solid to height of 3 feet on the Bukkur gauge and with moveable gates of 9 feet height above this for width of 4,100 feet, that the following will be attained:—

Immediately above the weir the low-water level will be permanently raised to 12.5 feet on the Bukkur gauge. It will gradually rise as the discharge increases on the river, and can be maintained by regulation of the gates at a height of 18 feet on Bukkur at all times when the river's discharge exceeds 200,000 cubic feet per second. (In practice, it would not probably be necessary to maintain this height: the gates will be lowered to maintain the water level only at height required by canal head works). The maximum flood discharge with gates open would pass over or through the weir at a height up-stream of the weir of 20.25 feet and down-stream at a height of 18 feet on the Bukkur gauge, i.e., the construction of the weir will cause a rise in the maximum flood level at the weir site of 2.25 feet. (Of course, if gates can be provided at a lower level than referred to, this flood level will be lowered. However, the estimates for protective embankments, etc., are at present framed, to be on the safe side, on this assumption.) At the Sind Canal, which is about 30 miles up-stream in low river and 25 or under in high water, the effect of the weir will be as follows:—

Where now we get one foot above sill on 10th May, we would have, with gates closed on the Bukkur weir, 1.65 on the Sind Canal. On 1st June, with an average river, we now have 3.5 on the Sind Canal and with the weir we would have 4.90.

On 29th June, we have 6 feet on the Sind Canal, and with the weir we would get 8 feet. Thereafter, gates would probably be opened, and levels in July and August would be much the same, but slightly higher than at present. The weir would have practically no effect on the Bagari or any canal north of the Sind; but it would give a permanent full supply for the Sukkur, and, with a new head or feeder from above it for the Ghat, would convert the latter as well as the former into perennial canals.

15. Attached sheet No. 2 shows the hydrographs of the river, after construction of the weir at Sukkur, and the Sind Canal, as compared with averages of the last ten years.

16. Sheet No. 3 is a general map of the country, showing weir site, lines of protective embankment up-stream, and alternative lines for feeders of the Ghar Canal. The latter have been shown without any preparatory survey of the country, and are, of course, only approximate; but they serve as the basis of an approximate estimate of cost.

17. The first difficulty that arises is to select a suitable head for the Ghar feeder. It must, if possible, be placed near the weir to secure its permanency; and with this object it will be advisable to provide under-slucices on the Sukkur side of the weir itself. There will probably be some difficulty in this, and it may have to be combined with a new head for the Sukkur Canal, but no definite opinion can be expressed on this point until proper surveys have been made and designs considered. Plan sheet No. 4 is the only information at present available which gives useful information on this point. It is probable that a suitable regulator in rock can be designed. If not, it will be necessary to consider the alternative of placing the regulator in the band line to the westward, but this would probably necessitate permanently maintaining a suitable dredger to keep open its feeder channel from the river.

18. This alternative would, however, have the very serious objection that the in-drought of such a large volume as this canal would carry, namely, 6 to 7 thousand cubic feet per second, might seriously endanger the safety of the band itself, and also tend to encourage the admittedly possible catastrophe of the river out-flanking Sukkur. Such a disaster is not at all likely to occur under existing conditions, with river bed levels at Sukkur well below the surrounding country; but, with the altered conditions of a weir blocking the lower levels of the discharge section of the main channel, it is not at all difficult to conceive circumstances which would render the turning of the river not only quite possible, but probable. For instance, I believe, while there should be no difficulty in constructing suitable river embankments up-stream of the weir to withstand any chance of being breached merely by water pressure, that, if the river happened to take a decided trend towards the right bank, the correction of this tendency with raised bed level at the weir site might involve an expenditure of enormous sums in the maintenance of suitable training and protective works, which, if unsuccessful in the early stage, would threaten disaster to the whole scheme.

19. I might dilate at considerable length on the possible dangers the river might threaten with altered conditions of bed such as have been considered up to this point, but it will be sufficient to state that, with the small amount of consideration I have been able to give the scheme up to the present, I would not be prepared to recommend the construction of a solid weir up to the level of 3 feet on Bukkur. This height has been chosen for the purpose of preliminary calculations of flood levels, etc., merely because at first sight it seemed suitable for that purpose.

20. The obvious conclusion is under-slucices in the weir must be provided in order to prevent interference with existing conditions of flood and water levels as little as possible. Whether suitable sluices can be built at the depths necessary to secure this object is not so easily answered. It is a most interesting subject for consideration and discussion, but for the present I propose to proceed with my general review, assuming for the time being that the engineering difficulties are surmountable.

21. *Estimate.*—The project will include the following:—

- (1) A weir or dam across the river so designed with under-slucices as to interfere with the height of flood discharges as little as possible, and also provided with under-slucices on both the Sukkur and Rohri sides of the river to secure a scour in front of the heads of the Ghar and Sukkur Canals on the Sukkur side and the head of the Nara Supply Channel on the Rohri side.
- (2) A lock on the Rohri side of the river for the passage of boats and steamers.
- (3) Protective embankments on each side of the river up-stream of the weir, suitable cross section, to safely withstand continued water pressure due to the maximum flood. The section chosen is as follows:—Top bank of 10 feet; top width at 6 feet above flood level; water and outside slopes 4 and 3 to 1, respectively, with an extra berm of 20 feet width at level of 2 feet below top water level added to the outside of the section.
- (4) Head regulators for the Sukkur and Ghar Canals.
- (5) Feeder for the Ghar Canal, capable of carrying a supply of 7,000 cubic feet per second.

22. The cross section for the weir has 16 feet width at 3 feet above the zero of the Bukkur gauge with down-

stream batter of 1 in 4 for a depth of 20 feet, and below that an increased batter of 1 in 3, which gives a width of 25·25 feet at 30 feet below the Bukkur zero. Allowing 2 feet for foundations, the whole quantity of masonry taken solid up to 3 feet on the Bukkur gauge amounts to 1,123,776 cubic feet. The openings for under-slucices will save at least half of the quantity above the foundations, but, to provide for a better class of facings, quoins, etc., at openings, one-third only is deducted. The total quantity up to 3 feet on the Bukkur gauge will then be 821,260 cubic feet, which is estimated at a rate of Rs. 150 per 100 cubic feet. Excavation for foundations is also taken at this rate. Both rates are practically double those at which the same classes of work could be done above water, and should be ample in any circumstances, even under compressed air. The flank wall is separately estimated, Above 3 feet, for estimating purposes, the weir wall is taken solid as was done below that level to simplify this approximate estimate. Rs. 4,00,000 are allowed for under-slucices. Lump sums are provided for the lock and regulator. The Ghar feeder is taken as a canal, 220 feet in width carrying 11·75 feet of water for its whole length, half the length being taken 7 feet in embankment and the other half length altogether in cutting.

23. The estimate works out as follows :—

	Rs.
Preliminary Expenses, Survey, etc.	50,000
Land Compensation	3,40,232
Weir	28,88,970
Lock	5,25,000
Protective Embankment	11,42,576
Regulator, Sukkur and Ghar	5,25,000
Feeder for the Ghat Canal	18,23,581
Total Works	72,95,359
Establishment at 21½ per cent.	15,68,502
Tools and Plant at 2 per cent.	1,45,907
Leave and Pension Allowances at 14 per cent. on establishment	2,19,590
Interest during construction	7,52,500
Grand Total, all Charges	99,81,858
Or, say —	
Works	73,00,000
Other Charges	26,82,000
GRAND TOTAL	99,82,000
Say	1,00,00,000

24. *Revenue Return.*—Mr. Tupper, Acting Collector of Larkana, has written a note on the expected additional area which will be cultivated, if the Ghar is converted into a perennial canal with feeder from above the weir site. He estimates the additional revenue expected as follows :—

	Rs.
On Sukkur Canal—	
Ratodero Taluka	20,000
On Ghar Canal—	
Kambar Taluka from Rs. 50,000 to Rs. 70,000, say	60,000
Nasirabad Taluka from Rs. 30,000 to Rs. 40,000, say	35,000
Larkana Taluka	20,000
Southern part of Ratodero Taluka	15,000
TOTAL	1,50,000

25. He, however, admits that he may have under-estimated the figures. I think that this is probably the case, especially when one examines the variation in the revenue realised on the Sukkur and Ghar Canals for the past ten years. The figures have been as follows :—

Canal.	Average realised for 10 years.	Maximum realisations	Minimum realisations.
Sukkur Canal	2,45,389	3,45,422	2,03,962
Ghar Canal	7,22,193	8,12,087	3,75,874
TOTAL	9,67,582	11,57,509	5,79,836

The difference between maximum realisations and averages should, I am of opinion, be taken as due to this project, because by construction of the weir both canals will be rendered perennial and independent of the river, and the figure which represents this should be added to Mr. Tupper's estimate, which relates only to lands not at present brought under cultivation.

26. The figures of revenue due to the work would then be as follow :—

	Rs.
On existing areas	2,19,900
On new areas	1,50,000
TOTAL	3,69,900

27. The Sind Canal would also receive benefit, though perhaps small; so also would the Rukan, Rani, Sanro and Janib on the Rohri side, all within a distance of ten miles above the weir. Unfortunately, I know nothing of these canals, which seem to be merely small canals taking off through sluices in the bund line, but owing to the large increase in higher supply which should be available at their heads it is probable that, taken together, they may be safely calculated to yield an additional revenue of at least half a lakh of rupees. The Sind Wah and other bund sluices on the right bank may also be credited with another half a lakh of rupees, and adding these figures to the previous expected realisation from the Sukkur and Ghar brings the total to Rs. 4,69,900.

28. It is equivalent to a return of 6·40 per cent. on works and 4·70 per cent. on works and all other charges, including interest, and, as this revenue return takes no account of possible advantages and proportional revenue which would result on the Jamrao and Eastern Nara systems, it would appear that the project is worth fully investigating, if the Engineers consider it practicable to construct a weir at a cost anything near that at which it has been approximately estimated.

29. This points to the advisability of first getting a reliable survey of the bottom of the river, but there is no time for this before the Irrigation Commission meet at Sukkur, and it would help greatly in the solution of questions likely to arise if, while there, the special Commission would discuss the practicability of constructing the weir or dam, assuming that the cross section is even more unfavourable than is shown on the section submitted.

30. Statements showing results of irrigation on the Sukkur, Ghar and Sind Canals are attached for reference.*

No. III.—Mr. J. L. RICE, I.C.S., Collector of Shikarpur.

Khan Bahadur Pir Buksh, the Deputy Collector of Rohri, to whom I showed the papers, estimates the increase of revenue in Rohri at half a lakh. He knows the country better than I do, but I am inclined to think his estimate rather too liberal. The only canals affected on that side (apart, of course, from the Nara supply channel) are the Janib Wah and Korai. They are small canals, and nothing much is to be expected from them, while I doubt whether any important system of canals is possible. The cost would be prohibitive, and there is not much unbroken ground.

The floods in the Ghar would certainly be made more certain and of greater volume, and there would be a good deal of rabi. But it is very difficult to give estimates. What would really happen is that there would be more good years in Rohri than hitherto.

As regards the Sukkur Division, I attach Mr. MacMunn's letter. Perhaps, he rather under-estimates, or rather, I should say is wrong in making no estimate at all. I doubt, however, whether even with a good supply in the Sind Canal, the extensive lands near the Jehan Wah in northern Naushahro could be irrigated from that canal.

The fact is that the principal result of a weir will be to give an early rise, a steady river, and a late fall. Now, when the crops fail, Government only bears an infinitesimal proportion of the general loss; so when crops are flourishing, the gain to Government (in rupees) is imperceptible almost compared to the general gain. Ultimately, no doubt, there will be actual pecuniary gain in the shape of higher rates of assessment, but at the beginning, when there are no large tracts of virgin soil to be brought under cultivation, an immediate return cannot be counted on.

*Not printed.

No. IV.—MR. V. C. MACMURR, I.C.S., Assistant Collector.

I do not think Mr. Dawson's scheme is meant to benefit this division much, and I do not suppose it would do so. There is a good existing supply on all the three canals—Sukkur, Sind, Begari; and the main effect of Mr. Dawson's scheme would be, perhaps, the removal of the restriction on the first of these. There is land, as Mr. Giles said, in the Drakhan-Madeji region, also about Ruk; but there is no extended area uncultivated, and none over which there is an actual lack of water, with the exception of the strip it was proposed to irrigate by the new Shikarpur Canal and the northern pieces of the Naushahro Taluka to the west, which are on the tail of long karias from the Begari. The Sukkur Canal would, no doubt, benefit from having a really permanent rabi supply, but I cannot put the benefit in figures.

On the whole, I should say that, while this division would profit, the profits would be small compared to that elsewhere, and would consist principally of advantages it is difficult to express arithmetically: *e.g.*, the one that would accrue from raising the height of water at the beginning and end of the inundation, and thus making the supply uniform.

One is forbidden to discuss the practicability of the scheme. But I would like to point out that the district between Mr. Dawson's "proposed line of bands" and the Sukkur-Begari is a very good piece of country—well populated, well cultivated. What is Mr. Dawson going to do with it? If he is going to flood it, he should be told to stop at once. But I suppose he does not mean to flood it. Why a separate supply channel? It was long ago suggested to enlarge the Sukkur Canal and feed the Ghar from it.

No. V.—MR. H. G. PALLISER, Chief Engineer, Indus Right Bank Division.

A.—SIND CANAL—

	Acres.
Culturable area commanded . . .	169,000
Maximum irrigation estimated by the Executive Engineer . . .	94,000
Area remaining . . .	75,000

The estimated "maximum irrigation" is about 56 per cent. of the culturable command, which agrees fairly with the combined Sukkur and Ghar Canals' figures, for which see B of this Note.

Given a higher supply in the Sind Canal, the Executive Engineer estimates that one-fourth of the "remaining area" of 75,000 acres will be irrigated, or, say, 18,800 acres, which at Rs 3 per acre will give a gross annual revenue of Rs. 56,400.

B.—SUKKUR AND GHAR CANALS—

	Acres.
Existing culturable area commanded by the two canals . . .	555,000
Of which average irrigation of last 10 years (up to 1900-01) . . .	=320,000
Actual average irrigation equals 58 per cent. of culturable command.	
Maximum area irrigated in 1894-95 was . . .	390,000
Equal to 70 per cent. of the command.	

The above "culturable area commanded" includes the Shahdadpur and the northern portion of the Ratodero Talukas, which are watered by the Sukkur and Ghar Canals with great difficulty and at the expense of heavy silting every year. The contour survey has conclusively shown that this particular part of the country must be taken over by the re-modelled Begari Canal, which can easily and naturally deliver ample supplies, the Begari water being at a higher level than either that of the Sukkur or the Ghar.

	Acres.
Culturable area commanded . . .	555,000
<i>Deduct—</i>	
Culturable area which will be transferred to the re-modelled Begari Canal . . .	135,000
Net culturable area remaining . . .	420,000
<i>Add—</i>	
Culturable area available in Gaibi Dero Jagir . . .	81,000
Do do Mirzapur . . .	18,000
Total culturable area to be commanded by the two canals . . .	519,000

Of the 420,000 acres remaining within the Ghar and Sukkur systems, 58 per cent. seems to be actually irrigated. This, if correct, is a very high percentage. Indeed, and there seems to be no possibility, therefore, of *extending* irrigation within the limits of the present command.

There are, however, 100,000 acres of jagir land which could be brought under command of the (extended) canals. Calculating on the high proportion of 50 per cent., there would be 50,000 acres of new irrigation, yielding, say, Rs. 50,000 gross annual revenue to Government in the shape of Hakabo.

But it must be remembered that the Ghar Canal when re-modelled, after relief of its impossible duties in Shahdadpur and the north, will be quite capable of watering the jagir country on the west during the kharif season, unassisted by any new Feeder Canal from the lake caused by the Bukkur Weir.

The proposed Feeder Canal would certainly raise the rabi level of the Ghar to something like the present kharif level, and would therefore secure the extension of rabi cultivation. But the existing irrigation is already 58 per cent. of the whole culturable command, and it is difficult to see how extension of irrigation can be brought about. The only result of increased rabi supplies would practicably be the substitution of rabi for some of the present kharif cultivation, and it is doubtful in the first place whether such substitution will be effected by the people to any considerable extent, and in the second place whether such substitution would secure any increased revenue.

In his Note, the Collector of Larkana estimates the annual increase of revenue due to improved supplies brought down by the proposed Feeder Canal from the Bukkur Weir as under:—

	From Rs.	To Rs.
(i) Ratodero Taluka, north . . .	15,000	20,000
(ii) Kambar and Nasirabad, do . . .	50,000	70,000
(iii) Larkana do . . .	18,000	20,000
(iv) Ratodero Taluka, south . . .	15,000	15,000
Total . . .	88,000	1,05,000

The north Ratodero figures have been excluded from the total, as that land will be taken over by the re-modelled Begari Canal.

The estimate seems a cautious one, and agrees with my general view of the probabilities.

C.—REVENUE DUE TO BUKKUR WEIR—

	Rs.
A.—Sind Canal . . .	56,400
B.—Sukkur and Ghar Canals.—	
The Collector estimates about . . .	1,00,000
The Gaibi Dero and Mirzapur jagirs will bring in Rs. 50,000, but the re-modelled Ghar would water this area without assistance . . .	50,000

Total Gross Revenue, say . . . 2,00,000

Against this must, in fairness, be set the loss of revenue from the land thrown out of cultivation on both banks of the river by the raising of the cold weather river level by the proposed Weir. It is true that such loss of revenue will be allowed for in the Weir project as an indirect charge under "Capitalisation," but none the less the revenue will be lost to Sind, and must be fairly reckoned as a set-off against the increased revenue from the Sind, Sukkur, and Ghar Canals systems. What such loss is likely to be, there are at this stage no figures to show.

No. VI.—MR. J. H. E. TUPPER, Collector of Larkana.

2. The scheme would affect 4 talukas in the Larkana Collectorate—Ratodero, Kambar, Larkana, and the northern portion of Nasirabad.

3. Improved supply in the Sukkur Canal will affect the northern portion of Ratodero Taluka only.

4. Improved supply in the Ghar will affect the southern portion of Ratodero Taluka, the whole of Kambar and Larkana, and the northern portion of Nasirabad.

5. It is apparent, therefore, that the effect likely to be exercised by the scheme on this district will be practically confined to the area commanded by the Ghar system.

6. I may observe, in passing, that the Sukkur Canal already gives both a kharif and a rabi supply, and that it is, I am told, capable of giving full supply with Bukkur gauge at 9 feet, *viz.*, 4 feet under what is usually described as "fair irrigation level" for other canals. In spite of this, the supply is at present unequal to the demand. It would appear, therefore, that what the Sukkur Canal stands in need of is increased bed width and a larger volume of water, and it is not clear from Mr. Dawson's letter that those remedies form any part of the Bukkur Weir scheme. Without this, the mere raising of the water level at Bukkur to 12.5 feet all the year round will exercise a comparatively trifling effect upon the canal, so far at least as it affects this district. If the carrying capacity of the canal can be increased at the same time, and the canal kept working during practically the whole year (as it was last year and is likely to be this year), I should estimate the yearly increase of revenue from the northern portion of the Ratodero Taluka at Rs. 15,000 to Rs. 20,000, not more, since the waste area in that portion of the taluka capable of being brought under cultivation is limited.

7. Turning to the Ghar system. The conditions on this canal are widely different from those of the Sukkur. The latter is a "perennial" canal and gives a full supply with a comparatively low river: the Ghar is not a "perennial" canal and can only give full supply with a high river. The Ghar is, therefore, likely to benefit to a far greater extent than the Sukkur by acquisition of a head above the weir commanding a permanent 12-feet supply.

8. The mere conversion of the Ghar into a "perennial" canal is not likely of itself to greatly increase the area under cultivation, but if the surface level of water in the canal can be raised some 3 or 4 feet (the bed level remaining the same—this implies a greatly increased volume of water also), the whole system is capable of great development. With the Ghar, the main point would appear to be raising of the surface level. This is all-important, because the major portion of the waste land available is capable of being brought under cultivation only if it can command a "mok" (flow) supply. This land, for the most part, contains a heavy admixture either of salt or of sand. Such land can be rendered fit for cultivation with comparative ease with a plentiful "mok" supply; but if a lift supply only is available, the task would be an impossible one.

9. The land which is locally known as "asal kalrati" and as "wariasi" may be left out of calculation, since it would require a great number of years and an unlimited supply of water to make it fit for the plough.

10. Other varieties of these two descriptions of soil, which contain respectively a smaller admixture of "kalar" and of sand, can be converted into good land with more or less trouble in proportion as the admixture is greater or smaller. The only requisite is a plentiful "mok" supply. The variety known as "kat kalar" especially is capable of being quickly converted into what is known as "dangachi"—an excellent rice soil.

The sandy soils, on the other hand, from "drib" downwards, are capable of conversion (given a "mok" supply) into the description of "latashi" or "latiari," known respectively as "gasari" and "drasari"—both excellent light soils, though not suited for rice.

11. Turning now to the talukas affected. Kambar and Nasirabad both contain large areas of saltish or sandy soils capable of conversion as above described into arable land—notably Kambar. I should say that the cultivable area of Kambar Taluka is capable, under the conditions described above, of an increase equal to one-quarter of the area at present cultivated, bringing in between Rs. 50,000 and Rs. 70,000 per annum as additional revenue.

12. As regards Nasirabad (of which the northern portion only depends on the Ghar), I have some hesitation in expressing an opinion, since it is three years since I was in charge. I should say that the taluka might be counted on for an increase of from Rs. 30,000 to Rs. 40,000 owing to a greater area under cultivation.

13. Larkana Taluka is already very heavily cultivated, and I do not consider it would be safe to speculate on an increased area under cultivation of more than six or seven thousand acres, representing an increase of, say, Rs. 20,000 in land revenue.

14. The southern half of Ratodero, which depends on the Ghar head, has suffered severely of late years, owing

to the low surface level of the water. With a month above the weir, this would be remedied. I do not, however, think that the additional area of land which could be given out for cultivation would amount to more than 5,000 acres, representing a revenue of about Rs. 15,000.

15. I may possibly have somewhat under-estimated these figures, but I should not myself care to speculate on an increase of more than 1½ lakhs as the result of new land brought under cultivation in this district by the proposed scheme.

16. This, of course, does not take into consideration the greater profit that would accrue to the cultivator from land already under cultivation, owing to his being able to calculate upon a certain, instead of a precarious, supply. This would doubtless mean ultimate enhancement of rates, and hence greater revenue from the whole cultivated area on the canal systems concerned.

17. I would notice one more point. Mr. Dawson writes that the new scheme would render the Ghar *practically* independent of changes at its mouth. From this, I infer that the existing Ghar and Ford Wah mouths will remain, and that the mouth above the weir is intended to be merely supplementary, and will not be designed to carry the full supply required for the whole canal. If this is so, there cannot, I presume, be any intention of greatly raising the surface level of the water in the canal, since, if this were done, the existing Ghar and Ford mouths would both be converted into escapes. If the surface level is substantially raised, both Ghar and Ford mouths must cease to exist as feeders. As I have pointed out, my calculations of increased revenue are based on the assumption that the surface level of the water in the canal will be raised 3 or 4 feet. If this is not the case, the increase of revenue is not likely to be more than one-third of what I have stated.

NO. VII.—MR. H. G. PALLISER, Chief Engineer, Right Bank Division.

There are no great expanses of what may be called virgin culturable land in this Division awaiting the construction of new canals, such as was the case in the Left Bank Division previous to the commencement of the Jamrao Canal, and such as may yet remain in the Hyderabad and Thar and Parker Districts. Speaking broadly, all the culturable waste land in the Right Bank Division can be commanded and watered by extensions of existing canals. These may be taken separately in geographical order, commencing from the north.

1. *Desert Canal.*—The "re-modelling" of this canal at a cost of about Rs. 11,00,000 will, it is hoped, be completed in time for the inundation of 1902. When completed, this canal will, it is believed on present information, reach its full development, and be capable of irrigating the whole of its command without probability of any feasible extension for years to come.

2. *Unhar Canal.*—Beyond extension of distributaries for watering interior command, not much can be done, as the land at the tail comes within the influence of either the Desert or the Begari Canal.

3. *Begari Canal.*—It is proposed to entirely "re-model" this canal and to extend the tail distributaries so as to irrigate the Shahdadpur and parts of the Ratodero Talukas, which have hitherto suffered from inadequate supplies from the Sukkur and Ghar Canals. The Begari will deliver higher water than either of these two canals, which take off much further down the river.

It is also proposed in the "re-modelling" scheme to investigate the possibility of taking in a larger portion of the Khelat territory for irrigation across the border near Khairo Garhi.

Surveys are proceeding, and will, it is hoped, be completed this next season.

4. *Proposed Shikarpur Canal* is an alternative to the widening and extension of the Begari Canal, the merits of the two proposals being judged on the results of the surveys now in hand.

5. *Mahi Canal* (on the left bank of the river, but included in the Right Bank Division) will be completed next season at a cost of about Rs. 7,60,000. When completed, it will probably be found that there is a good deal of land at the tails of the Dehar, and of the other distributaries of the new Mahi Wah, which could be brought under command by extensions. This would involve a fresh survey and a new estimate, and can be seen to next season.

6. *Sind Canal.*—No extension is possible, beyond that of the distributaries, as the tail country comes within the sphere of either the Begari or the Sukkur Canal.

7. *Sukkur Canal*.—Some of the country at the tail, at present watered with difficulty, and at the expense of much silting, will be taken over by the re-modelled Begari. This will relieve the Sukkur, and enable it to extend its sphere of usefulness in the southern direction, thus in turn relieving the Ghar.

8. *Ghar Canal* is proposed to be entirely "re-modelled," and the preliminary contour survey was commenced last season and will, it is hoped, be completed by next hot weather. The Shahdadpur country in the north-west will be taken over by the Begari Canal, which delivers water there at a higher level, and the Ghar will then be fitted to carry out its full legitimate duties to the southwards, where the water-supply is under present conditions defective. Extensions will also be worked out so as to include the Gaibi Dero and the Mirzapur jagirs, situated in the west, under the hills, and hitherto not served by any irrigation system. The culturable area of these jagirs is believed to be about 100,000 acres.

9. *Western Nara*.—Complaints have been rife for many years past of the unsatisfactory working of this great canal, and proposals have from time to time been made for partial improvements, some of which have been carried out in fairly recent times. But experience does not encourage the continuance of such patch-work, and it is now proposed to institute an exhaustive enquiry into the whole system of irrigation, commencing with the indispensable contour survey, to show how the levels of the land lie everywhere, and then to proceed cautiously and scientifically with a complete scheme for re-modelling. A history of the canal has just been prepared, and an estimate for the contour survey is being submitted for the sanction of Government.

There are large areas within the system which receive no supply of water at all, and others with a defective supply. There is no question of extension, but of construction of new branches and re-arrangement of old ones, so as to make a complete and homogeneous system of the whole Western Nara irrigation, from the mouth near Larkana down to the Mauchar Lake and Sehwan.

10. *Karachi Canals*.—From Sehwan to Kotri, the strip of culturable land between the river and the hills is narrow and there is no scope for any but very small extensions.

Below Jerruck, the country opens out into the deltaic formation, and both banks of the river are included in the Right Bank Division.

On the left bank, enquiries are proceeding for extensions of two small canals (Laikpur and Ali Babar) near the Pinyari, which will bring, perhaps, 10,000 acres into cultivation. Further south, near Sujawal, there is a proposal for a new small canal (called Gungri Chahatho) which will take about 12,000 acres of waste land; and still a little further south it is proposed to extend the Satrah Canal to irrigate 6,000 acres of new land, as well as to improve the supply to existing cultivation.

On the right bank of the river, there are no actual proposals as yet for extensions, but it is thought that there will be no difficulty in bringing a few thousand acres of fresh land into cultivation.

11. The order in which the above schemes may be considered is very much the order in which they have been enumerated, except that the small projects in the Karachi Canals District can be worked up simultaneously with, but of course independently of, the larger schemes of Upper Sind.

Statements laid before the Commission by the Commissioner in Sind.

A.

Statement showing particulars of total Area, cultivable Area, and occupied Area for the Province of Sind from 1870-71 to 1899-1900.

Year.	Total Area.	Cultivable Area.	OCCUPIED.				Unoccupied Land in 1898-99.	Unassessed cultivable Land in 1893-99.	
			Alienated.	GOVERNMENT OCCUPIED.		Total of Columns 4, 5, and 6.			
				Cultivated.	Fallow.				
1	2	3	4	5	6	7	8	9	
1870-71	Information not available.			1,976,598	0	
1871-72		2,012,863		0	...	...	...
1872-73		2,214,500		0	...	...	...
1873-74		1,870,211		0	...	...	...
1874-75		2,514,804		0	...	...	...
1875-76		1,966,069		0	...	...	...
1876-77		2,417,614		25	...	...	...
1877-78		1,740,054		20	...	...	...
1878-79		3,350,770		23	619,032	11	3,969,802	34	...
1879-80		2,496,314		15	976,033	1	3,472,347	19	...
1880-81		2,915,194		27	897,847	6	3,813,041	33	...
1881-82		3,050,364		1	662,536	18	3,712,900	19	...
1882-83		3,072,949		17	718,978	4	3,791,927	21	...
1883-84		2,611,559		18	1,038,104	11	3,649,663	29	...
1884-85		2,894,539		39	1,063,902	24	3,958,441	63	...
1885-86		2,711,631		31	1,345,454	5	4,057,085	36	...
1886-87		2,749,615		22	1,772,524	35	4,522,140	57	...
1887-88		2,645,267		26	2,115,491	2	4,760,758	28	...
1888-89		25,074,696		33	16,055,720	6	41,130,416	39	...
1889-90	26,091,171	30	10,651,674	33	36,742,845	63	...		
1890-91	28,406,569	30	12,174,559	8	40,581,128	38	...		
1891-92	28,998,315	6	14,104,834	35	43,103,149	41	...		
1892-93	29,852,543	5	14,855,731	9	44,708,274	44	...		
1893-94	29,867,564	30	14,917,344	38	44,784,908	76	...		
1894-95	29,927,335	10	14,899,081	17	44,826,416	27	...		
1895-96	29,926,653	23	14,983,314	37	44,910,367	60	...		
1896-97	29,934,985	0	18,896,814	32	48,831,799	32	...		
1897-98	29,959,479	13	18,944,791	30	48,904,270	43	...		
1898-99	29,953,568	26	18,960,894	18	48,914,462	44	829,397 36		
1899-1900	29,964,231	19	14,072,937	5	44,037,168	24	5,291,441 30		

B.

Statement showing net Area cropped, Area irrigated, and other particulars for the Province of Sind from 1885-86 to 1899-1900.

Year.	Net Area cropped.	IRRIGATED AREA.			Balance representing unirrigated Area.
		Area irrigated from Canals.	Irrigated from other Sources.	Total Area irrigated.	
1	2	3	4	5	6(a)
1885-86	1,469,781*	1,238,010	228,589	1,466,599	3,185
1886-87	1,567,468*	1,330,662	220,544	1,551,206	16,262
1887-88	1,649,586*	1,436,904	204,397	1,641,301	8,285
1888-89	2,393,183	1,721,319	274,949	1,996,268	396,915
1889-90	2,955,763	2,149,196	415,549	2,564,745	391,018
1890-91	2,881,810	2,014,911	489,572	2,504,483	380,327
1891-92	2,710,127	2,061,542	304,115	2,365,657	344,470
1892-93	3,144,676	2,259,299	467,601	2,726,900	417,776
1893-94	3,069,294	2,300,434	347,956	2,648,390	420,904
1894-95	3,470,255	2,600,499	462,948	3,063,447	406,808
1895-96	2,655,188	2,009,271	123,601	2,132,872	522,316
1896-97	3,226,331	2,451,736	130,066	2,581,802	644,529
1897-98	3,802,482	2,734,107	183,517	2,917,624	884,858
1898-99	3,056,756	2,361,525	123,571	2,485,096	571,660
1899-1900	2,781,014	2,493,028	151,119	2,644,147	136,867

(a) Column 6 includes Barani cultivation in the Desert and throughout Sind.

* Figures for Thar and Parkar are not available.

C.

Statement showing the extent to which each of the principal Products was cultivated in the Province of Sind.

Year.	CEREALS.						Other Crops.	Total Area cultivated.	Deduct twice-cropped Area.	Net cropped Area.
	Rice.	Wheat.	Juari.	Bajri.	Others.	Total.				
1	2	3	4	5	6	7	8	9	10	11
1885-86	422,405	223,214	312,885	210,095	10,751	1,179,353	439,360	1,618,713	148,929	1,469,784
1886-87	456,063	193,709	394,731	220,412	9,840	1,274,755	415,829	1,690,584	123,116	1,567,468
1887-88	449,193	200,882	435,280	260,088	12,485	1,357,937	395,342	1,753,279	103,693	1,649,586
1888-89	633,917	234,433	541,588	508,421	16,957	1,935,866	616,912	2,552,778	159,095	2,393,183
1889-90	656,544	337,271	584,988	768,836	32,575	2,429,764	748,757	3,178,521	222,753	2,955,763
1890-91	706,157	405,775	462,450	719,533	27,692	2,351,607	770,995	3,122,602	237,742	2,884,810
1891-92	682,206	418,704	432,466	696,819	27,687	2,257,882	687,660	2,945,542	235,415	2,710,127
1892-93	641,796	543,815	559,555	859,610	36,851	2,641,627	759,053	3,400,680	256,004	3,144,676
1893-94	697,435	473,232	468,440	760,424	29,819	2,459,350	841,552	3,300,902	231,608	3,069,294
1894-95	680,086	649,115	532,955	749,839	40,337	2,652,632	1,081,884	3,734,516	264,261	3,470,255
1895-96	654,573	301,963	457,810	730,459	13,719	2,158,024	629,032	2,787,056	131,868	2,655,188
1896-97	734,539	388,920	741,714	750,264	14,614	2,630,051	761,469	3,391,511	165,180	3,226,331
1897-98	898,663	572,797	741,243	806,534	32,989	3,052,226	1,012,375	4,064,601	262,119	3,802,482
1898-99	898,268	350,785	514,813	769,956	18,835	2,552,637	733,973	3,286,630	228,874	3,056,756
1899-1900	715,881	327,358	483,506	255,200	11,059	1,793,004	1,203,454	2,996,458	215,474	2,781,014

D.

Statement showing assessed Area on Canals and actual Cultivation in Government Land.

Year.	Assessed Area on Canals.	ACTUAL CULTIVATION ON CANALS.	
		Area.	Assessment.
1880-81	...	1,328,602	3,193,444
1881-82	1,960,155	1,418,957	3,747,828
1882-83	1,864,946	1,508,292	3,825,448
1883-84	1,696,543	1,362,107	3,613,265
1884-85	2,956,777	1,586,279	4,130,237
1885-86	2,905,146	1,532,722	3,959,475
1886-87	2,930,817	1,593,668	4,124,748
1887-88	3,161,487	1,695,795	4,195,589
1888-89	3,476,356	1,845,388	4,733,592
1889-90	3,664,769	2,109,804	5,326,695
1890-91	3,593,598	1,955,149	5,003,322
1891-92	3,639,191	1,949,717	5,146,667
1892-93	3,930,831	2,184,368	5,695,480
1893-94	3,985,746	2,186,825	5,710,381
1894-95	4,343,191	2,357,438	6,353,905
1895-96	3,725,172	1,796,399	4,840,609
1896-97	3,935,423	2,109,067	5,957,737
1897-98	4,139,951	2,525,039	6,790,224
1898-99	3,981,964	2,175,912	5,912,101
1899-1900	4,242,797	2,286,853	6,301,712

E.

Statement showing Cultivation on Wells in the Province of Sind during the twenty years commencing from 1880-81 and ending in 1899-1900.

Year.	No. of Wells.	Area.	Assessment.
1	2	3	4
1880-81 . . .	3,747	21,085	57,779
1881-82 . . .	2,326	12,676	33,068
1882-83 . . .	1,976	12,470	28,315
1883-84 . . .	2,970	17,987	46,701
1884-85 . . .	2,305	14,815	32,650
1885-86 . . .	2,089	13,597	29,505
1886-87 . . .	2,645	16,393	40,333
1887-88 . . .	2,610	17,091	39,175
1888-89 . . .	3,222	19,582	45,261
1889-90 . . .	2,387	13,148	31,329
1890-91 . . .	2,309	12,864	31,413
1891-92 . . .	3,291	19,373	49,927
1892-93 . . .	1,525	7,029	18,788
1893-94 . . .	1,620	8,471	23,549
1894-95 . . .	1,012	4,774	11,512
1895-96 . . .	4,465	24,355	69,980
1896-97 . . .	4,021	21,130	58,521
1897-98 . . .	2,202	11,092	29,913
1898-99 . . .	5,060	27,700	78,318
1899-1900 . . .	5,617	21,722	54,962

F.

Statement showing Cultivation on Canals and other Sources independent of Canals (such as River-spill, Barani, etc.,) in the Province of Sind.

Year.	TOTAL CULTIVATION.		DETAILS OF CULTIVATION.					
			ON CANALS.		ON WELLS.		OTHER SOURCES.	
	Area.	Assessment.	Area.	Assessment.	Area.	Assessment.	Area.	Assessment.
	1	2	3	4	5	6	7	8
	Acres.	Rs.	Acres.	Rs.	Acres.	Rs.	Acres.	Rs.
1891-92 . . .	2,626,474	61,33,667	1,949,717	51,46,667	19,373	49,927	657,384	9,87,073
1892-93 . . .	2,997,226	70,96,898	2,184,368	56,95,480	7,029	18,788	805,829	13,82,630
1893-94 . . .	2,905,763	68,29,657	2,186,825	57,10,381	8,471	23,549	710,467	10,95,727
1894-95 . . .	3,204,142	75,81,759	2,357,438	63,53,905	4,774	11,512	841,930	12,16,342
1895-96 . . .	2,294,671	56,11,023	1,796,399	48,40,609	24,355	69,980	478,917	7,00,434
1896-97 . . .	2,771,947	70,28,834	2,109,067	59,57,737	21,130	58,521	641,750	10,10,576
1897-98 . . .	3,500,088	81,74,356	2,525,089	67,90,224	11,092	29,913	963,957	13,54,219
1898-99 . . .	2,820,400	66,51,318	2,175,912	59,12,101	27,700	78,318	616,788	6,90,899
1899-1900 . . .	2,559,784	70,13,816	2,286,853	63,01,712	21,722	54,962	251,209	6,57,142

Note.—The figures in Cols. 8 and 9 include cultivation in the Desert.

G.

Statement showing culturable Government Waste Lands in Sind and what they depend on for Irrigation according to the entries in the Settlement Registers as ascertained in 1890-91.

District.	Unoccupied assessed Land.	Unassessed cultivable Land.	Total cultivable Land.	Dependent on Canals.	On River.	On Wells.	On Barani.	Unprovided for.	Total.
		1898-99.					1890-91.		
Karachi . . .	128,329	1,056,540	1,184,869	87,129	9,541	151	149,088	813,276	1,059,180
Hyderabad . . .	401,079	1,557,400	1,958,479	650,237	8,595	...	17,666	1,431,947	2,108,445
Shikarpur . . .	162,350	1,261,344	1,413,694	148,818	57,820	...	191,098	1,865,390	2,263,121
U. S. Frontier . . .	50,563	331,532	382,095	114,012	32,875	20	...	256,129	403,036
Thar and Parkar (Desert excluded).	76,505	692,006	758,511	47,232	...	...	4,848	708,453	760,533
TOTAL . . .	818,826	4,878,822	5,697,648	1,047,428	108,831	171	362,690	5,075,195	6,594,315

NOTE.—In his No. 6150 of the 26th September 1898, Mr. Muir-Mackenzie said to the Government of India that it was estimated not long ago that 10,000 square miles of irrigable lands were still left in the Province. This coincides with the figures in this Return.

H.

Statement showing Gross Revenue, Remissions and Net Revenue for Collection for the Province of Sind.

Year.	Total Land Revenue.	Deduct Remissions.	Net Revenue for Collection.
	Rs.	Rs.	Rs.
1870-71	41,98,466	97,843	41,00,618
1871-72	42,31,590	1,49,971	40,81,619
1872-73	44,63,654	3,80,366	40,83,288
1873-74	40,17,707	4,03,643	36,14,064
1874-75	42,19,934	6,92,283	35,27,651
1875-76	37,85,547	1,94,101	35,91,446
1876-77	42,25,029	4,17,252	38,07,777
1877-78	37,75,786	1,30,329	36,45,457
1878-79	49,29,950	2,97,457	46,32,493
1879-80	42,13,396	1,10,677	41,02,719
1880-81	42,82,486	73,146	42,09,340
1881-82	49,07,505	50,731	48,56,774
1882-83	52,09,697	2,46,886	49,62,811
1883-84	48,55,740	1,21,599	47,34,141
1884-85	55,33,425	1,33,087	54,00,338
1885-86	55,07,310	2,01,837	53,05,473
1886-87	57,96,510	1,70,409	56,26,101
1887-88	58,49,461	76,830	57,72,631
1888-89	65,39,689	94,359	64,45,330
1889-90	77,98,652	3,77,937	74,20,715
1890-91	75,69,102	1,99,658	73,69,444
1891-92	72,36,930	2,96,680	69,40,250
1892-93	80,42,072	3,66,854	76,75,218
1893-94	77,52,164	3,57,456	73,94,708
1894-95	87,91,559	5,78,352	82,13,207
1895-96	66,39,204	4,68,399	61,70,805
1896-97	80,91,750	1,75,661	79,16,089
1897-98	95,05,080	3,98,985	91,06,095
1898-99	78,25,196	3,72,289	74,52,907
1899-1900	80,15,413	6,74,767	73,40,646

I.

Statement showing Takavi Advances made under the Land Improvement Loans Act, XIX of 1883, and the Agriculturists' Loans Act, XII of 1884, in the Province of Sind.

Year.	TOTAL ADVANCES.		
	Land Improvement Loans Act XIX of 1883.	Agriculturists' Loans Act XII of 1884.	Total.
	Rs.	Rs.	Rs.
1870-71			1,900
1871-72			6,210
1872-73			19,562
1873-74			83,412
1874-75			14,512
1875-76			29,889
1876-77			12,617
1877-78			78,413
1878-79	3,000	75,413	28,583
1879-80	5,100	33,488	16,016
1880-81	1,000	15,016	47,371
1881-82	4,200	43,171	33,463
1882-83	5,250	28,213	50,239
1883-84	5,075	45,164	29,181
1884-85	2,950	26,231	25,630
1885-86	5,485	20,145	23,610
1886-87	8,585	15,025	15,537
1887-88	3,250	12,287	16,585
1888-89	3,690	12,985	44,533
1889-90	12,095	32,438	61,945
1890-91	12,350	49,595	1,11,129
1891-92	26,598	84,621	1,38,565
1892-93	32,295	1,06,270	1,13,974
1893-94	53,293	60,681	1,35,951
1894-95	63,714	72,237	2,33,606
1895-96	1,36,049	97,557	2,01,825
1896-97	1,15,450	86,375	64,041
1897-98	29,674	34,367	2,80,940
1898-99	1,88,916	92,024	6,10,513
1899-1900	2,71,518	3,38,995	

* For the Financial year 1897-98, no takavi grant was made to Sind owing to requirements for the Famine districts in the Presidency.

J.

Return showing the approximate Yield per Acre of the principal Crops in the Province of Sind (1892 to 1897) as ascertained from Crop-Experiments.

Name of Crop.	AVERAGE OUT-TURN IN LBS. PER ACRE CROPPED.											
	PROVINCE.		U. S. FRONTIER DISTRICT.		SHIKARPUR DISTRICT.		KARACHI DISTRICT.		HYDERABAD DISTRICT.		THAR AND PARKAR DISTRICT.	
	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.	Irrigated.	Unirrigated.
1	2	3	4	5	6	7	8	9	10	11	12	13
Rice	1,485	...	...	...	1,683	...	...	...	...	...	1,336	...
Wheat	944	...	903	...	1,246	...	929	...	1,083	...	560	...
Barley	962	...	902	...	720	...	1,721	...	504	...	...	...
Juari	853	...	652	...	1,167	...	585	...	1,008	...	...	...
Bajri	708	...	1,147	...	640	...	400	...	840	...	516	...
Gram	478	...	302	...	846	...	325	...	440	...	...	...
Til	269	...	295	...	120	...	120	...	420	...	393	...
Sugarcane	3,705	...	...	...	...	...	4,850	...	2,560	...	...	...
Cotton, cleaned	283	...	...	...	...	...	...	...	74	...	492	...
Rape Seed	513	...	346	...	711	...	368	...	715	...	428	...

Note.—Rice—In Shikarpur, the experiment was conducted on *Sagdasi* and in Thar and Parkar on *Ratrio* rice in 1897-98.

WITNESS No. 1.—MR. E. F. DAWSON, Superintending Engineer, Indus Left Bank Division.

1. Q. (The President.)—I understand, Mr. Dawson, you are the Chief Engineer, Right Bank of this canal?—No. At present I am Superintending Engineer, Indus Left Bank Division, acting for Mr. Dunn, who is absent.

2. Q. How long have you been connected with these works?—I have served as Executive Engineer, Sind, 4½ years and as Engineer and Secretary, Indus River Commission, for 9 months.

3. Q. I suppose there is no question of famine relief works?—I think not. Last year there was a threatened scarcity caused by people coming in from Kutch.

4. Q. You never consider it necessary to keep up a programme of relief works?—Such is never called for. We only open so-called famine works to meet the requirements of people coming in from Kutch.

Mr. E. F. Dawson.

5 Nov. 1901.

Mr. Dawson. 5. Q. The point that concern us in the Irrigation Commission is to enquire how the irrigation system can be improved so as to add to the various food supplies required for the country. We should like your opinion on this?—My information is based on the replies given to the written questions already asked. To begin with, what strikes me is the very large area of land that is cultivable but is not cultivated or assessed, 700 square miles. I suppose you understand we have in Sind a system of fallows.

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6. Q. Will you explain this system?—We are supposed to allow for three years' fallow and one year's cultivation. The area commanded is therefore four times at least the area that will be cultivated annually. In some ground crops are grown year after year, but ordinarily there is three years' fallow, and the revenue settlement provides for only that, calculating one-third of the area as assessment.

7. Q. You deliberately provide for only irrigating each year $\frac{1}{3}$ of the area?—Yes, the land won't stand irrigation every year.

8. Q. Had you occasion to go into that?—No, we have statistics but our projects provide for irrigating only $\frac{1}{3}$.

9. Q. As the result of your observations, does it appear a reasonable thing to reserve such a large amount of fallow?—Yes, in the present condition of the people.

10. Q. I suppose there is no restriction. They may cultivate the whole area?—Yes. Land is assessed as lift or flow, but a man is not allowed to convert lift into flow without permission.

11. Q. Can you tell me approximately the relative area of kharif and rabi?—I can't give it to you otherwise than in a blue book.

12. Q. I suppose the "lift" is rabi. You give in statement "C" the total area cultivated. I suppose the wheat crop represents the rabi?—Not altogether. We have a large area of Jhamba and other oil seeds.

13. Q. As far as water is concerned, putting aside lands under fallow, I suppose there is plenty of water for increasing the rabi cultivation?—No, not in our canals.

14. Q. In the river?—Yes, there is ample water. We have measured 34,000 cubic feet a second. That would increase as the river rises, but it is on too low a level to be utilized in canals. We are excavating the beds of some of the canals to give a supply at what is called the fair irrigating level. We speak of 13 feet on Bukkur as being a fair working level and it corresponds to 17 feet at Kotri. It would not pay us to deepen some canals because they would become silted early in the season. Certain of our canals are very good rabi ones.

15. Q. You mean it would not pay at the present assessment rates?—It would probably disturb our system altogether to irrigate specially for rabi.

16. Q. What is, roughly speaking, the bed slope of canals?—Usually $5''$ to $1'$ per mile, sometimes *nil*, the surface slope is then given by the rise of river.

17. Q. What is the slope of the country?—Near the river itself it is running inland sloping 9 inches to a foot and then reduces to 4 inches per mile.

18. Q. Sloping away from the river?—Yes.

19. Q. I find in one of the papers the remark that "well irrigation need hardly be noticed—27,000 acres?"—Yes, the statement is given, but I think the Revenue Department had better explain how it is classified. I think it is due to our canals, by the water level being raised, but it has been classified as wells and not under canals.

20. Q. But still the wells are very largely used?—Yes.

21. Q. What about is the depth of spring level?—Perhaps a little back from the river face we should find water in a few feet. It follows the ground level.

22. Q. What is about the outside the cultivators have to raise water?—Ordinarily ten to twelve feet. But in Hyderabad our canals get very little flow, the irrigation is all lift and the wells are deeper, down to 50 feet I think. Outside the canal tracts they have deep wells up to 80 feet.

23. Q. Even where they are only 10 feet below the surface would cultivators prefer canal water?—I really don't know. I think they would if they got flow. We have certain restrictions on the description of cultivation to be grown. We might not allow them to grow rice on such lands.

24. Q. Then there is a restriction on rice?—Yes. Owing to the larger quantity of water it requires.

25. Q. Do the cultivators apply to the Collector for permission to grow rice?—Yes, to the Assistant Collector, who passes it on to the Engineer concerned.

26. Q. Is the silt which comes into your canals fertilizing of sorts?—I think not appreciably. If it puts merely a skin on the ground the people undoubtedly praise it, but I find if silt is brought by flood it often gives trouble.

27. Q. Have you both large and small inundation canals?—Yes.

28. Q. Are the small ones private property?—No. Practically all the canals in Sind are in Government charge. There are a few private ones and they are gradually being absorbed.

29. Q. Are those in Government charge under the Irrigation Department?—Yes.

30. Q. You are responsible for clearance?—Yes.

31. Q. What are about the maximum and minimum levels on the Bukkur and Kotri gauges?—We mark every year on a diagram the average of ten years. This diagram shows the heights. It starts in the month of January. Our present average height is about 5' on Bukkur.

32. Q. That is the minimum?—No. Two feet below zero.

33. Q. What is the average?—About zero.

34. Q. What does it rise to?—Starting at zero it just touches the foot and then on to $1\frac{1}{2}'$ in February, then to 4. At the end of March, and at the beginning of April it rises to 5'. At the end of May it reaches 6'9". We get a temporary rise in the middle of May. This year it went to an enormous height. At Dera Ghazi Khan it reached a maximum record. From the 1st June it rises to $11\frac{1}{4}'$ at the end of June. Even on the 10th July it reaches $12\frac{1}{2}'$ and it stands at that height until the end of August. The final height it may reach varies from about 12' to 17'9". The minimum I have not here.

35. Q. Then there are variations of at least 6 ft. between the maximum in one year and the maximum of another?—We generally approach 13.

36. Q. Then it might be as low as 12 and it might be as high as 16?—Yes.

37. Q. You are engaged on the Indus Survey?—Yes. We are doing what we can.

38. Q. Do you go further up than your own province?—No.

39. Q. Would not that be necessary?—No. If we think there has been erosion of the river face we survey the river for a few miles above and below and leave on record possibilities of future movements. We are also measuring discharges.

40. Q. And taking cross sections?—Yes, depths, cross sections and velocity measurements.

41. Q. In your answer to question 5 "areas of irrigation, etc.," you give a table. It gives altogether the areas commanded 44,000 acres, besides which I gather there are 150,000 acres which may possibly be irrigated by proposed canals?—Yes.

42. Q. These are extensions which might be made to the canals?—Yes.

43. Q. Do you think that you will add nearly 1 million acres?—Yes.

44. Q. This million acres, what is it going to cost? How many lakhs of rupees?—Possibly 45 lakhs or 50. I have not got estimated figures. I am not familiar with these figures because I have only had charge of the Division for a short time.

45. Q. Then you say 10 lakhs of irrigation for 50 lakhs of rupees?—Yes, I think that would be a fair estimate.

46. Q. According to the present system, in one year you would irrigate a third or fourth of that?—I believe that is right. I am not sure of the figures. It may only be a third that we expect to get out of that.

47. Q. Have you had experience of land that seems to be injured by salt or *reh*?—I have had experience of it. I prefer not to mention any opinion on the subject. At Karachi we get rice, but a poor description, requiring a large amount of water.

48. Q. To come back to private canals, are they the property of single individuals or communities?—I think of single individuals.

49. Q. I understand there is a very large area here under *jagir*?—Yes.

50. Q. Are these the men who make private canals?—Yes.

51. Q. As regards making new canals would you make any difference where it is *jagir* land?—Yes, because we only get a *hakabo* rate. It may be 8 annas an acre.

52. Q. Would you avoid such lands?—Yes.

53. Q. On the other hand, I suppose many of the *jagirdars* get canals by *takavi*?—Yes, I think so.

54. Q. It is a boon giving them free water?—Yes, that is what it comes to.

55. Q. Is there any irrigation in Sind done from mountain torrents in the west?—Very little; they bind up small streams.

56. Q. You are in favour of constructing a weir at Sukkur? Yes, but more information is required before I can come to a final decision. Until I came to answer certain questions put by Mr. Higham we had nothing at all prepared regarding this scheme.

57. Q. You estimate the cost at 100 lakhs?—Yes, that includes interest.

58. Q. Have you any real doubt on the subject as to where the site of the weir should be. Must it be above Sukkur?—Yes; there is no other point where it could be except at Jhermek. That project was examined very carefully with a view to taking an irrigation canal to Karachi, but after examination, it was considered that it would yield no return.

59. Q. When you say no sites what do you mean?—No suitable foundations.

60. Q. Do you think there is practically no site elsewhere?—No.

61. Q. (Mr. Higham.)—The statement you have given us shows about ten thousand square miles in Sind that are irrigable but at present not provided for by irrigation?—I have not got that statement. I have not seen it.

62. Q. Have you any idea what the area is that remains to be taken up?—No. I have no idea.

63. Q. The cultivable area is 13 million acres of which you irrigate 2½ million acres a year?—Yes.

64. Q. Are you supposed to irrigate one-third of the area commanded?—Yes, we are, however, doing very much more than that on some canals.

65. Q. On a broad average you irrigate that?—Yes, that is what it practically amounts to.

66. Q. Of 7½ million acres commanded you irrigate 2½ million acres, that leaves about 5 millions?—Yes, but I don't know what the 5 million acres mean. It may include all sorts of land.

67. Q. What would be the result of constructing a weir and raising the level of supply to the canals on the right and left bank and giving a perennial supply? What additional area would it enable you to bring under cultivation. What would it put on the right bank?—I estimate that on the average we might expect nearly 4 lakhs of rupees.

68. Q. I am talking about areas; what would be the additional area of cultivation?—About 120,000 acres on the right bank.

69. Q. That would be new cultivation?—Altogether new cultivation on lands which don't get water now except on rare occasions of flood.

70. Q. Multiply that by 3, the actual portion under command, that is, 360,000 acres, and you would improve the conditions of supply to the existing cultivation?—It would render the existing cultivation permanent and secure.

71. Q. What additional area would you take up on the left bank?—I don't know what the figure is, but Mr. Joyner says 300,000 acres practically would be brought under cultivation.

72. Q. The greater part of the left bank is in foreign territory?—Yes, Bahawalpur and Hyderabad.

73. Q. Would the land in Bahawalpur be under command?—It will be practically "flow" instead of "lift."

74. Q. I think on the left bank of the river the present irrigation is chiefly "lift"?—Yes.

75. Q. If you make the weir it would be flow?—Yes.

76. Q. What is the difference in the rates of flow and lift irrigation?—I think the rate would run Rs. 2-4-0 for

lift and Rs. 3 for flow, but a smaller quantity of water would irrigate a larger quantity of land. Mr. Dawson.

77. Q. Would it only cost 12 annas to lift the water?—Mr. Joyner estimates it would cost 12 times that. 5 Nov 1901.

78. Q. If you give flow irrigation although the revenue would not increase much the cultivator would benefit?—Yes.

79. Q. (Mr. Higham.)—Is there not a large area in the Hyderabad tahsil not irrigated at all?—Yes.

80. Q. (The President.)—There is plenty of room for extension of irrigation in Sind?—Yes.

81. Q. If the weir is made at all you will take full value out of it?—I think so.

82. Q. (Mr. Higham.)—Is there any reason to suppose that the withdrawal of supplies from the Punjab will injuriously affect the supply in the Indus canals?—In my opinion none at present, because of the cold weather discharges. All that we require is for the Nara and the Phuleli and those which have cold weather irrigation. I don't think it can have any effect. The Punjab canals only take 20,000 cubic feet.

83. Q. What is the minimum discharge of the river?—Last year we measured 35,000 cusecs. The measurements we have only had for the last two years and the discharge does not necessarily vary with the gauge.

84. Q. That 35,000 was measured at Kotri and the same at Sukkur?—Yes, nothing goes off between.

85. Q. That is exclusive of what is passing down the Nari, how much does that take?—Probably not more than 2,000 a second at this season of the year.

86. Q. It is immaterial?—Yes.

87. Q. If we take another 10,000 cusecs off in the Punjab would not that affect this discharge?—It might affect our supply slightly.

88. Q. When do you open?—Between the middle and end of May.

89. Q. What would your supply rise to in May?—I have shown we get 100,000 per second with a gauge of 6' on Sukkur. A withdrawal of 5,000 cusecs would not have any effect at all.

90. Q. Then the proposal for a weir is not with the object of preventing the retrogression of the Sind canals owing to the withdrawal of water in the Punjab?—No, the weir is required to ensure command and extend cultivation in Sind. At present if we wish to make extensions we must deepen the 'take off' of our canals.

91. Q. With your weir you will get an increase in the surface slope?—Yes.

92. Q. And therefore a less deposit of silt?—Yes, in the Nari not in the canal.

93. Q. That would only extend a short distance because you get on natural levels again. So from consideration of this subject you think you should build a canal at Sukkur for a crore of rupees?—Yes, if it is practicable at all.

94. Q. What would be the advantages of it. It is unnecessary, I understand, to prevent the present canals falling back?—No, it would convert the Sukkur and Ghar into perennial canals. We would then have an area for efficient cultivation. We might have a large tract on the left bank at Hyderabad. The combined revenue from these improvements would unquestionably give us a return of more than 6 to 8 per cent. on capital cost.

95. Q. Assuming the cost would be a crore?—Yes. Then we would be saved all the trouble and necessity for surveys at the mouths of the Ghar and Sukkur which limit the area on account of the uncertainty of the supply, and we would also provide for extensions a great deal more than is possible at present. Opening up the Hyderabad area would be an enormous improvement.

96. Q. The supply would be much more constant?—Yes, it would be permanent in a sense.

97. Q. That would lead to an increase of assessment?—Yes, finally.

98. Q. In the meanwhile the average supply would be brought up to the level of the maximum?—I think so unquestionably. The real difficulty is construction, which involves masonry work with compressed air at a depth of 40 feet and provision of sluices.

Mr. Dawson. 99. Q. Might you not divert the river from one side to the other?—I think not. That is my present impression.
5 Nov. 1901. It would be a magnificent work if it could be carried out.

100. Q. Are none of the canals supplied with distributaries?—Yes, they have branches.

101. Q. What is the length, provided?—I could not answer. We have long distributaries. Down in Karachi they have very small distributaries.

102. Q. The water courses belong to the villages?—Yes.

103. Q. What length; how many miles?—I can't give you the figures. I have not looked at them for years.

104. Q. (*Mr. Ibbetson*).—Do your canals ever fail in drought?—We have scarcities.

105. Q. Within your experience to what would that scarcity amount, what proportion would the contracted cultivation bear to the area of crops ordinarily matured?—It might be $\frac{1}{2}$ in bad years.

106. Q. That is a maximum?—Yes, and that would be only on specially bad canals that had something wrong with their mouths.

107. Q. Is very much damage done by water-logging?—There has been, but practically none since the embankments were made.

108. Q. Have not drainage works been executed?—We have spent $\frac{1}{2}$ crore of rupees on the Jamrao. On that system they have a drainage system as part of the project.

109. Q. Do you think that drainage is required?—I think so in certain tracts.

110. Q. Has compensation ever been given within your experience for the damage done?—Never.

111. Q. Don't you think it would be right to give compensation when you injure a small tract for the benefit of an immense number?—I think it is the fault of the cultivator taking too much water in order to give full benefit of the silt for rice cultivation.

112. Q. What form does the injury take?—Marshes, etc.

113. Q. Does the health of the people suffer seriously?—Fever is a result.

114. Q. Are the remissions considerable?—In some years.

115. Q. What proportion of revenue is given?—We have flood remissions and remissions for shortage of water. The latter is given on the examination of the revenue official and a village *punch*; so much by the aggregate outturn on the area concerned.

116. Q. If you get a four-anna crop, you would not charge half rate?—No.

117. Q. The assessment is made by the village *punch*?—Yes.

118. Q. You have nothing to say to that? Do you think that the remissions are liberal?—Yes, very liberal.

119. Q. What credit, direct or indirect, is made to your canals?—The whole revenue realised on the area of irrigated land, after deducting, I think, 5 per cent. for collection.

120. Q. The assessment is levied only on land sown, is it not?—Yes, but it is compulsory to cultivate each field periodically. A man has to pay his assessment if he does not.

121. Q. How far are the Sind canals provincialised?—They are all Imperial.

122. Q. Does the Provincial Government get no share at all of the Revenue?—I think none.

123. Q. Do you experience any difficulty in getting money to extend canals?—There was some difficulty a few

years ago, but lately we have been treated very well. At present there is a difficulty in getting funds for works classed under 43 instead of 49.

124. Q. That is extensions and improvements to existing canals and extending others?—Yes, we have such projects as the Hasanali. We may be able to spare money for 49, we have a difficulty to get it for 43.

125. Q. We are told that you have some ten thousand square miles of land unirrigable but irrigated. Your statement shows that $\frac{3}{4}$ of the cultivable land is irrigated and that $\frac{1}{4}$ is lying fallow. You told us also that you have schemes which would add materially to the area irrigated, and that large extensions are possible?—Yes.

126. Q. During the past 13 years there has been next to no increase in cultivation and next to no increase in irrigation. (Witness produced statement to explain.)

127. Q. Within the last 11 years have there been any large extensions?—Not very much. We have constructed a large number of works, which have, however, not yet begun to show results. The next few years ought to show a considerable increase. We have also secured stability of irrigation; the annual area fluctuates much less than formerly.

128. Q. Suppose you had unlimited money could you extend irrigation practically to an unlimited extent?—No, to an unlimited extent. We should have to bring in labour from outside.

129. Q. You are doing that?—Yes.

130. Q. You say that a good many of the existing canals were made originally by the people, and that the private canals have been gradually absorbed. Has the process gone on in your own experience?—Yes, we have cases.

131. Q. Why has it been necessary to absorb them?—Owing to the neglect of the owners who had become bankrupt the lands fell out of cultivation and the people themselves appealed to Government to take the canals over.

132. Q. Has the existence of private rights in canals impeded progress on Government canals?—Yes. But not appreciably.

133. Q. In a tract where Government is not prepared to extend irrigation within the next 20 years, would it not be a good thing to stimulate the construction of private canals?—We have very few tracts in which to give out rights for private canals. There is little room for them.

134. Q. Has there been any trouble on private canals in the recovery of dues?—I don't know.

135. Q. Do you charge any royalty on private canals for the water?—I don't know. They are mostly on *jagir* lands.

136. Q. Do you know what the owners of the private canals take from cultivators as water-rate?—No. I think it is a share of the crop.

137. Q. Have you any experience of the working of the statute labour system?—I have had a few such canals in my charge, and it is thought unsatisfactory. Some men do not do their share.

138. Q. If the men don't finish their share of work it has been necessary to take it over?—Yes.

139. Q. Is it not the case in Sind that canal water is only used to start the rabi which is matured by the wells?—I don't think that is the case here although it may be to some slight extent on particular tracts.

140. Q. Have you any knowledge of tracts which are irrigated from wells without canal water—that are independent of wells?—No.

WITNESS 2.—*MR. T. SUMMERS*, Superintending Engineer, Indus Right Bank Division.

Mr. Summers. 1. Q. (*The President*).—I understand you are acting as Superintending Engineer?—Yes, of the Right Bank.

5 Nov. 01. 2. Q. The part you know best is the left bank?—Yes.

3. Q. We wish to ask you about the left bank. How many years have you been in Sind?—Ten years.

4. Q. What is your opinion about the extension of rabi irrigation? Do you think it should be encouraged?—Yes, decidedly.

5. Q. Would you do it by converting the present inundation canals into perennial canals?—Yes, as far as possible.

6. Q. We were told just now by Mr. Dawson that if we increase the number of perennial canals there will be tremendous increase in the amount of silt? Do you share that opinion?—These large perennial canals don't silt, they scour out, at any rate this is the case with the Fuleli canal.

7. Q. I gather from what Mr. Dawson says, at all times in the year there is a silt deposit?—There was in the last five miles only of the Fuleli, before the escape was opened in 1899, now there is none. It scours out above?

8. Q. What is your greatest slope?— $3\frac{1}{2}$ inches a mile is the bed slope of the Fuleli.

9. Q. Have you experienced any other canal excepting the Fuleli?—Some of the large branches of the Fuleli with discharges up to 1,600 cusecs don't silt at all.

10. Q. I suppose where silt does exist, it is near the canal heads?—Yes, of the branches. They all silt except some large ones, which don't silt at all except at their tails, when there are no escapes.

11. Q. And is this silt clearance a costly business?—Yes, about a lakh and a quarter for the Fuleli: it used to be 1½ lakhs: it is greatly reduced.

12. Q. I suppose clearance of silt is all done by manual labour?—Yes.

13. Q. I understand the Fuleli Canal was an inundation canal and you made it into a perennial canal. Was there any difficulty with the cultivators?—No. They took to it at once. They get flow in the cold season in the lower reaches. The result of making the Fuleli perennial, at a cost of only 2 lakhs of rupees, has been to provide a cold-weather supply of about 1,200 cubic feet per sec., which will eventually bring in an extra revenue of several lakhs.

14. Q. And you command the country well?—Yes. In the lower portion of the Fuleli for about 40 miles, the land is low, but in the upper half the land is high.

15. Q. Is there any possibility that a weir built at Sukkur would affect it?—If an extra 4,000 is taken off it would affect the depth of the Indus by about 9 inches to a foot, if it is running 50,000 cubic feet per second.

16. Q. How far is the head of the Fuleli below Sukkur? I could not say. (This was measured from the map and put at 300 miles.)

17. Q. Have you had any occasion to question this system of having three years' fallow to one year's crop?—No, not at all.

18. Q. You are not concerned?—No.

19. (Q. Mr. Ibbetson.)—Do you think that turning the canals into perennial canals will do away with the necessity of fallow?—No.

20. Q. You don't agree with Mr. Pulliser that if the rabi is increased it will be at the expense of the autumn crop?—No.

21. Q. Are you getting near your limit?—No, about ¼th of the cultivable area is cultivated.

22. Q. The increase of irrigation on the Fuleli is 80,000 acres in the ten years ending 1900-1901. Is that increase due to a reduction of fallow area?—It is principally owing to the duty of water being increased from about 48 to between 53 and 60 acres per cubic foot per second of discharge, by putting a stop to waste and distributing the water by rotation. Most of the cultivation on the Fuleli is rice.

23. Q. Are further extensions possible?—Witness explained his project for the new Hussain Ali Canal for a second escape and for further improving the irrigation of the Fuleli Canal. He said that encouragement of boat traffic was very important. The cost of camel carriage to the people in the Badin taluka used to be 1 lakh a year. Now that the grain and rice is carried by boats it is only Rs15,000 a year.

24. Q. How much money has been spent on the Fuleli?—Less than a lakh a year—perhaps 5 lakhs altogether during the last ten years.

25. Q. And by how many acres did the irrigation increase?—Say 80,000.

26. Q. That comes to 6 rupees an acre?—Yes, and with little more expenditure. We have not got to the limit of distribution. We want distributary channels?

27. Q. How far do you irrigate from your canal by private water-courses?—There is a private one 40 miles long.

28. Q. How far do the villages take the water from the canal?—Perhaps 3 or 4 miles.

29. Q. You would alter that by making distributary channels?—Yes, and masonry outlets.

30. Q. Does any part of your work take you into the villages?—Not much. We are fully engaged in carrying works, distributing water, and stopping waste and have little time to think about crops.

31. Q. Do you do the rotations?—Yes, it is all done by us.

32. Q. Does the system work well do you think?—Yes.

33. Q. There is no clashing of authority between the canal officer and the revenue officer?—Not in rotation;

they help in that. It is only in waste of water that I have had any clashing. The fines are too small.

34. Q. Is there much still on your estimates to be spent on the Fuleli?—The Hasan Ali Wak is a sanctioned project and the second escape is another one, which will cost 4 lakhs of rupees.

35. Q. Supposing a weir could be built to suit the Fuleli and other canals, do you consider it a desirable thing to have it?—I don't think it would pay.

36. Q. You don't see any urgent need of it?—No, because if we improve the canal system we have now we can irrigate all we want. (Described on map.)

37. Q. I think you heard the questions I put to Mr. Dawson. Did anything occur to you on which you would be inclined to express a different opinion?—No, except that the Fuleli escape is really a drainage canal. The whole of this country used to be absolutely water-logged and the people used to take their cattle away to the high lands. Those 'dhunds' (depressions) are now turned into the finest cultivation.

38. Q. What causes do you think have kept back irrigational progress in Sind?—Perhaps too much work for the engineers to do.

39. Q. Insufficient staff?—Yes.

40. Q. Have you had any experiences of private canals?—Yes. There is one of the largest private canals in India from the Fuleli.

41. Q. How does it work?—Very well—I believe. The owner irrigates more than he is allowed by his sanad.

42. Q. You refer to a private canal from the Fuleli?—Yes.

43. Q. Does the owner use the whole water himself or does he give the water to others?—Does he sell water to others? He uses most of the water for his own land. Just within a week or two before leaving the district I looked into his sanad and found he was taking more water than he was allowed.

44. Q. It is a jagir?—Yes, a single owner.

45. Q. Have you any other experiences of private canals? There are several smaller ones.

46. Q.—Of private owners?—Yes.

47. Q. Would you stimulate the making of private canals?—I don't think it would work. Private canals are often given up.

48. Q. They don't as a rule irrigate successfully?—No.

49. Q. Still admitting all that, in a tract where Government is not prepared to extend irrigation would it not be a good thing to have those private canals?—Yes; they do more good than harm.

50. Q. You would encourage them?—Yes.

51. Q. There is scope for that?—Yes, a little scope.

52. Q. (Mr. Higham.)—Has your experience been confined to the Fuleli Canal?—Entirely.

53. Q. Not on any other?—No.

54. Q. How many years?—Ten years.

55. Q. Is the Fuleli entirely different from the others in respect of the surface slope?—It's average surface slope is 4½ inches a mile.

56. Q. It's bed slope is only 3½ inches a mile?—Yes.

57. Q. (The President.)—What is the discharge?—10,000 cubic feet per second is the maximum discharge, 7,000 the average.

58. Q. (Mr. Higham.)—What are the improvements made in the Fuleli. (Described on map.)

59. Q. Is the burden on the cultivators in clearing their water-courses very considerable?—No, I don't think so.

60. Q. Clearing the silt from the water-courses?—No, I think it is quite easy for them. They do it in a few weeks.

61. Q. Are there not further improvements proposed?—Constructing distributaries will cost many lakhs of rupees. There are thousands of water-courses, all with *kachcha* mouths.

62. Q. Have you always been able to get hold of money you wanted for improving? How much do you spend a year?—Nearly ½ lakh a year.

63. Q. Do you mean on new works?—Yes.

64. Q. Half a lakh a year for improvements?—Yes that is about the average.

Mr.
Summers.
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Mr. Summers.

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65. Q. You know nothing about private canals taking off from the river?—Very little.

66. Q. If private owners are allowed to take canals away without restriction are they not likely to interfere with the Government canals?—They will come in the way of our new canals.

67. Q. Is there not danger from that?—There might be. If we make this new Hasanali Canal very few, if any will come in the way.

68. Q. Do they often make new canals?—Hardly ever.

69. Q. (Mr. Rajaratna Mdlr.)—You just told us that owing to certain improvements made on certain canals a private owner has benefited very largely. When were those improvements carried out?—Some years ago one of them and the private owner will benefit still further, later on.

70. Q. To what extent has he benefited? Can you give a rough idea?—He gets a better supply because the water level is raised in the Fulchli.

71. Q. In the increase of area of cultivation or how has he benefited? Has the area increased?—Yes, the area or cultivation has increased.

72. Q. Is the canal officer responsible for measuring the area?—The Revenue Department only.

73. Q. Was the fact brought to the Revenue authorities notice that he has benefited by it? How does the Revenue Department know?—As far as I recollect, I wrote to them about the cultivation. It is an important question. If he is going beyond his sanad, he should pay a large assessment.

74. Q. You referred to some wasting of water. How is it wasted?—Flooding jungle or waste land.

75. Q. What is their object in doing that?—They may get little patches of grass to grow or it may be simply carelessness. For instance, one of the Municipal Commissioners told me that they had to carry the water-courses across low ground and had to bank them up. Cattle walked across them and knocked them down and flooded the fields, for which he said, they should not be held responsible, and, similarly they have been accustomed to wasting much water.

76. Q. (The President.)—Is there any particular fine for this?—No, but I think they should pay the full rates of assessment for unauthorized cultivation in such cases.

WITNESS NO. 3.—MR. F. ST. G. GEBBIE, Executive Engineer, Jamrao Canal.

Mr. Gebbie.

5 Nov. 01.

1. Q. (The President.)—I understand, Mr. Gebbie, you are Executive Engineer of the Jamrao Canal?—Yes, northern section.

2. Q. That is on the right bank?—No; left bank.

3. Q. The Jamrao is the newest project you have?—Yes, it has only been completed two years.

4. Q. You were there from the first?—Practically from the first.

5. Q. Is it perennial?—Yes.

6. Q. It is a branch of the Eastern Nara river?—Yes.

7. Q. And has it a masonry head?—Yes.

8. Q. What volume of water does it supply?—About 3,000 cubic feet per second.

9. Q. What is your longitudinal slope?—From the head to the fall it is 1 in 5,000 and after that $6\frac{1}{2}$ inches per mile.

10. Q. Do you find the silt clearance a serious difficulty?—No, we have had no trouble.

11. Q. Is the Jamrao an entirely new canal?—Entirely new.

12. Q. How did the country do before; was there no cultivation?—There was a little cultivation.

13. Q. The effect of this Jamrao Canal has been to bring a large area under cultivation which should go on increasing?—Yes, up to a certain limit.

14. Q. Would you explain to us the system of colonization on this canal?—Only a few villages on the Dim Minor have been colonized. In these there are about 1,600 Panjabis, chiefly from Jullundur and Gurdaspur. At first many

of these men were very discontented and wished to return to the Panjab to try and get land on the Jhelum Canal; but the excellent results of the past kharif season have altered their views. The rest of the land in the northern district is cultivated by the original owners, who have some difficulty in getting sufficient labour; but this is gradually coming in from Cutch, Marwar, and Guzerat.

15. Q. Have you much difficulty in getting money for these projects?—I don't think there was much for the Jamrao.

16. Q. Do you know anything about 75,000 acres to be brought under the Ghar Canal?—No.

17. Q. Who has been working it up?—Two Executive Engineers, Mr. Wright and Mr. Karpur.

18. Q. Did you get out any proposals with regard to the improvement?—There were no proposals made except to supply the Ghar from the Sukkur. The natural levels are against it.

19. Q. Do you know what the supply is in the Eastern Nara. It varies with the inundation. It is about 21,000 cubic feet per second at the top of the inundation. At present it will be 8,000.

20. Q. And is it all the water they want?—That is all the water they want in the Jamrao.

21. Q. Are there any further extensions?—In the Mithrao there are, not on the Jamrao.

22. Q. Could they utilize more water on the Eastern Nara than they get at present?—I don't know.

23. Q. Is the rabi supply there too low?—Not on the Jamrao. The Eastern Nara is in flow all the year round.

WITNESS NO. 4.—MR. R. J. KENT, Executive Engineer, Public Works Department.

Mr. R. J. Kent.

5 Nov. 01.

1. Q. (The President.)—You are Executive Engineer, Western Nara?—Yes.

2. Q. How long have you held that charge?—Six months.

3. Q. From where does the Western Nara obtain its supply?—It takes off from the right bank of the Indus about five miles from the large town of Larkana.

4. Q. Is it a permanent canal?—It was originally an old branch of the Indus, but is now an inundation canal.

5. Q. Has it got sluices and a head regulator?—It has no head regulator, but there are many sluices across it, in the lower reaches, for regulating the supply.

6. Q. Is it an executive division by itself?—Yes, since the year 1890.

7. Q. I suppose the executive work upon it is chiefly clearance of silt?—Yes.

8. Q. Have any improvements been carried out recently?—Yes, during the past twelve years many large improvements have been carried out, including the construction of two new feeders to the main canal from the river and several large branch canals.

9. Q. It is one of the old-fashioned inundation canals?—Yes.

10. Q. Is the silt clearance expensive?—In the main canal although the bed slope is only about 3" per mile still the amount of silt deposited is very small, and for many years past no expenditure has been incurred in clearing it. The reason for not silting must be attributed to the excellent draw-off by the large number of branch canals.

11. Q. Have you any proposals for improving the canal?—Yes. It has been proposed that a new canal should be taken out from the river for the purpose of relieving the Nara of the greater part of its irrigation in the last 40 miles. This canal would bring a large area under command which is too high to receive flow water from the Nara and which can only be irrigated in good years by lift under the present system.

12. Q. When does the Western Nara cease to flow?—This depends on the condition of the mouth. This year it ceased to flow at the end of November.

13. Q. Would there be any advantage in deepening the channel?—I think not.

14. Q. Would it be any advantage to the people to have *rabi* water?—It might be, but on the whole the people seem to be fairly contented as they are. Years ago the area round the Mancher lake was the finest wheat-growing tract in Sindh.

15. Q. Why has it fallen off?—Before the river bunds were made the Indus flood used to pour large volumes of water into the Mancher and the surrounding country. On the fall of the river this was drained off again into the river by a natural escape which exists to the south of the district. The large area so drained was sown with wheat and other *rabi* crops. The object of the river bunds was to prevent destruction to canals and to enable the cultivators to grow

khariif crops which hitherto had been impossible owing to the flood water sweeping all before it.

Mr.
R. J. Kent.

16. Q. If we had a weir made at Sukkur the Western Nara would link into it?—It might, and it would then be a perennial canal.

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17. Q. (Mr. Higham.)—Are there any distributaries on this canal?—Yes, there are a great number.

18. Q. Are they all Government channels?—Yes.

19. Q. Do you want any more of them?—Yes, several new distributaries are being investigated.

20. Q. What fall have they got?—Falls varying from 3" to 9" per mile.

Witness 5.—Mr. P. J. CORBETT, Executive Engineer, Public Works Department.

1. Q. (The President.)—You are Executive Engineer of the Begari Canals?—Yes.

2. Q. Have you been long in that position?—I went up last April. I was there twice before for short periods. I know something about the country.

3. Q. This is a group of canals?—Yes, there are three main ones—The Begari, the Unherwah, and the Desert Canal.

4. Q. Are they all inundation canals?—Yes.

5. Q. Are they far above Sukkur?—About 34 miles in a straight line—50 miles by river.

6. Q. How much is the irrigation in that system?—On the Begari 285,000 acres, on the Unherwah 80,000 acres, on the Desert Canal 130,000 acres.

7. Q. Of the total culturable area, you estimate that one-third is annually irrigated?—Yes. The Deputy Commissioner considers that on the Begari Canal, we should allow for half the culturable area being annually irrigated.

8. Q. As a matter of fact you think that in land, one-half lies fallow?—I should not say that generally. It depends on whether the cultivators can get sufficient water, and labour.

9. Q. Is a great extension of cultivation possible?—Yes. The potential area of irrigable land in Baluchistan is about 500 square miles. (Explained from the map.)

10. Q. Have you gone into the reason for allowing the large amount of fallow?—The reason is supposed to be that land won't stand cultivation more than one year in three. Another reason is that there is not sufficient labour and manure.

11. Q. The Baluchis are not cultivators?—Practically not so far as canal cultivation is concerned.

12. Q. The population is scanty?—Very. Do you get labour from the Punjab. It chiefly comes from Afghanistan.

13. Q. You are too far up to be affected by the question of a weir at Sukkur?—Yes. The only effect the weir would have in my district would be to make the course of the river more stable by reducing slightly its hydraulic gradient.

14. Q. Have you much trouble with silt?—There is a good deal of trouble in old branches. There is no silt in the first 47 miles of the Begari Canal. The Desert Canal is being remodelled. The surface velocity at its head is six feet per second. The Begari Canal has also a large velocity.

15. Q. How far has the remodelling of the Desert Canal got?—We have completed the remodelling up to the 34th mile. The work will be completed this year with the exception of a new canal, the Adiwah, which is included in the project.

16. Q. How far has the remodelling of the Begari got?—We have completed the Contour Survey for the last 46 miles of the Canal. Two large new branches have been surveyed and levelled, and the main canal and all its branches have been surveyed and levelled. One of the branches 50½ miles long, runs into Khelat territory.

17. Q. You have no estimate or data to lay before Government?—A project called the Shikarpur Canal has been completed. The Begari Canal Remodelling is an alternative to it. The idea is to find out which is the better scheme. Everything is purely tentative. The Begari Remodelling scheme is not being done on its merits, but to find out what it is worth. I am opposed to the large branch canal into Khelat territory.

18. Q. Have you knowledge of the other canals?—The Begari discharges 7,000, the Desert Canal about 5,000, and the Unherwah 2,000 cusecs. Two new branches from the Desert Canal are being made in Baluchistan.

Mr. Corbett.

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19. Q. Then you will have command of a very large area of waste land in Baluchistan and British territory from the Desert Canal?—Yes. Large areas have been given out to Biluchi Zemindars. Last season some land was given out to a Murri Zemindar.

20. Q. Where do Biluchi Zemindars get their labour from?—Chiefly from Sind. They are not importing more labour now because they got all the Sindhi labour they wanted when the Desert Canal was first made.

21. Q. (Mr. Ibbetson.)—Now remodelling is being done there must be more labour. Where will the Biluchi Zemindars get people to do their increased cultivation?—From Sind and possibly the Punjab.

22. Q. (The President.)—Is there a dense population in Baluchistan on your canals?—Yes, probably is dense.

23. Q. Where do you make your head-quarters?—During the hot weather I am supposed to be on the Kashmir Bund. This is the first year that the Executive Engineer has been allowed to go to Sukkur.

24. Q. (Mr. Higham.)—Where is the Kashmir Bund?—(Described from the map.)

25. Q. What have you been doing on the Desert Canal?—Its remodelling has been under construction for the past three years.

26. Q. What is the estimate?—About 13 lakhs including the Adiwah.

27. Q. On what lines are you remodelling?—Widening and regrading the existing canal and branches and constructing new branches. In Khelat we are making two new branches to replace seven old kurias. I am now proposing distributaries from the branches so as to save the cost of constructing pukka kuria sluices, and to enable me to control and regulate the water-supply.

28. Q. How is the canal working where remodelled?—Extremely well. The people get *moke* (flow) water where formerly they only get *cherki* (lift), and they get a plentiful supply.

29. Q. The result of that would be that you irrigate the greater portion of the area commanded?—They started doing so, but locusts and grasshoppers came and ate up the young shoots twice.

30. Q. You are giving out new land?—Yes.

31. Q. Will the new land be occupied?—Yes, all the land the Deputy Commissioner could give out was given out.

32. Q. Do they give the land free of assessment?—No, but practically free from malikana or occupancy fee.

33. Q. On the Begari you have a scheme of remodelling. What new land will be taken up?—It is proposed to add portions of the Ghar, and Sukkur Canal systems to the Begari. It is also proposed to extend the cultivation in Baluchistan. Waste land commanded by the Begari, but for which water is not available, has not been yet given out.

34. Q. Is it possible to command much land in Khelat?—Yes, if the remodelling proposals are carried out. The potential area of irrigation from my district is about 500 square miles.

35. Q. You only get a maintenance rate from Khelat?—The Baluchis pay us one rupee per acre. They have agreed to pay Rs. 1-8 per acre for all land irrigated by the Desert Canal after it is remodelled.

Mr. Corbett. 36. Q. That rupee an acre goes to cover the cost of maintenance?—I don't know how it was arrived at. The canal is a political one constructed to tempt the Baluchi tribes to settle down. It has been successful in that object.

5th Nov. 01. 37. Q. What do you estimate the rate of maintenance per acre?—About six annas.

38. Q. You don't make much profit from irrigation in Khelat?—No.

39. Q. When you go into Khelat territory how is the management done?—There is no management. The people irrigate the land and the tehsildar sends an annual statement showing the area cultivated.

40. Q. You have no particulars?—No.

41. Q. If we put a weir at Sukkur, it will not affect your canals?—No.

42. Q. I suppose it would have this effect. The Sukkur Canal would be taken up from the weir and you could send

more water on into Khelat?—I don't follow that. I don't think it would command the land up there.

43. Q. Is not the river altered very much?—Very much.

(Explains from the map.)

44. Q. (*Mr. Rajaratna Mdlr.*)—You say new lands ready for irrigation are given free of water-rate?—No: free of malikana or occupancy fee. On the Begari, I believe they charge Rs. 2-8 0 in places.

45. Q. The whole assessment is remitted for some years?—No, assessment is charged every year. No malikana or occupancy fee is charged.

46. Q. (*Mr. Ibbetson.*)—On entering into occupation of the land this (occupancy fee) is remitted?—Yes.

47. Q. (*Mr. Rajaratna Mdlr.*)—And not water-rate?—There is a consolidated assessment for land and water. The irrigation department is credited with $\frac{1}{8}$ ths of the consolidated assessment. No remission of the consolidated assessment is given unless in case of the failure of crops.

SIXTH DAY.

Sukkur, 6th November 1901.

WITNESS No. 6.—MR. E. PINHEY, Executive Engineer, Karachi Canal.

Mr. R. Pinhey. 1. Q. (*The President.*)—I understand you are in executive charge of the Karachi Canal?—Yes.

6 Nov. 01. 2. Q. How long have you held this charge?—I have only held charge since April last, but was in the same district for about ten months in 1897.

3. Q. How long have you been in Sind?—Since early in 1893.

4. Q. What is the total area of irrigation?—About 70,000 acres on the Punjari and about 206,000 for the whole district.

5. Q. Are your canals all inundation canals?—Yes.

6. Q. Are any of them used for growing rabi crops?—Yes, the Pinyari flows and the Bhagar flows a little in the cold weather; the rabi irrigation is all by 'lift'.

7. Q. Is there much scope for an increase of irrigation on lands which have not yet been touched by canals? Have you any projects for extensions?—There are one or two for improving the canals.

8. Q. Is there any wish among the people to have rabi irrigation? would it pay to deepen the canals so as to make them perennial?—I should not think so. The irrigation from lift is so small at present as compared with the total.

9. Q. It might be extended if they chose to extend lifts?—At present lift irrigation is so small; it would never be very big; there is no inclination to irrigate from the lift, judging from my experience of what they do in Sind.

10. Q. Is that because of want of energy on the part of the people or is it because it does not pay them?—Partly because of both. In the Western Nari district the land that was formerly irrigated has been deserted in parts and the men have gone to the tail of the canal where they can get flow irrigation.

11. Q. Is the difference between the rates for lift and flow irrigation great?—Not very great I believe.

12. Q. Have you any private canals in your district?—None that I know of.

13. (*Mr. Higham.*)—You were speaking about cultivators leaving lift irrigation, and deserting the upper reaches to go to the tails of the canals in order to get flow?—I said that with reference to what is left on the Western Nari irrigation.

14. Q. Is not that due to the fact that the cost of the lift is so much greater, owing to the small difference between the lift and the flow rates?—It may be, but I think it is due to its being easier to get cultivation on flow and it pays better.

15. Q. If they could get flow they naturally would?—Yes. The rice crop they get on flow pays them better I believe.

16. Q. Have you much land under command now that was formerly unoccupied?—Very much (refers to map and explains.)

17. Q. Everything you have water for is fully occupied?—I have no surplus water, but I could irrigate 30,000 acres more by making improvements.

18. Q. Where is this 30,000 acres?—(Explained on map.)

19. Q. Is the rainfall in the Karachi district more than that further north?—I think not. It is very uncertain. In 1897 there was about 13 inches, and in the last three seasons we have not had a couple of inches in each year.

20. Q. Is the canal irrigation supplemented by wells; do they require wells?—No.

21. Q. Can they mature the rabi crop without wells?—I don't know. There are wells, but they also use water standing in the big canals that has not dried up.

22. Q. They lift it?—Yes.

23. Q. To mature rabi crop they must lift water either from canals or wells?—Yes.

* On subsequent enquiry I find there are some private canals. — E. P., 8-1-02.

WITNESS No. 7.—MR. R. GILES, Commissioner in Sind.

Mr. Giles. 1. Q. (*The President.*)—I understand, Mr. Giles, you have been many years in Sind?—Yes. I have been here close on 33 years.

6 Nov. 01. 2. Q. And know the whole province from end to end?—I have been in every taluka and know something of every part of the province.

3. Q. (*The President.*)—We are not concerned here with questions of famine relief, but it is our duty to enquire how far Sind can subscribe towards the food supply of the country and what improvements and extensions can be made in irrigation. What we wish first to ask you is to explain some

points in the tables, which were sent to us which we find it difficult to understand. What chiefly strikes us is the large area (said at one place to be 10,000 sq. miles) not assessed and not cultivated?—It is described not quite correctly I think as irrigable.

4. Q. (*The President.*)—The figures are given in the footnote to statement "G." Mr. Muir Mackenzie said it was estimated that 10,000 sq. miles of irrigable land were still left in the province?—I have gone very closely into the question and undoubtedly the word "irrigable" is wrong and should be 'culturable,' that is, fit for cultivation

whether by irrigation or rain water, wells, etc. I would prefer referring to the statement which follows G among the Revenue Statistics; with regard to every taluka I have some knowledge and therefore I can show you by turning to one taluka only that the word cannot mean "irrigable" as it includes land irrigable by rain, land which the Tapadar (who is the lowest Revenue official) has classed as cultivable. He doesn't know whether the Indus water can be brought to it or not; the real proper expression for such land is "fit for cultivation."

5. Q. What do you think, with the amount of knowledge we now have, would be a safe estimate of the area in Sind uncultivated but cultivable and irrigable from the Indus?—When I was discussing it with Mr. Dawson yesterday he said perhaps a good estimate would be a fourth of the 10,000 sq. miles, i.e., of the 64,00,000 acres, but I think a larger area. Mr. Dawson said that his was a very rough estimate. My opinion is that the area is distinctly larger. It is quite clear that the 64 lakhs was a mistake. Take for instance Karachi, where the cultivable area is shown as 51,000 acres. If anything is settled it is that Karachi will not be irrigated by the Indus. That question has been thoroughly threshed out in former years by the Engineers.

6. Q. By "Karachi" you mean Karachi district?—No, the taluka.

7. Q. There is no canal irrigation in the taluka?—None. I have a report from the Deputy Collector of the Shahbandar Division in which he says an area approaching two lakhs is irrigable in that Division alone, but yesterday I discussed this with Mr. Dawson and Mr. Summers who was the Executive Engineer of the Canal Division from which the water would be supplied and they were of opinion that probably 50,000 would be irrigable from the Indus.

8. Q. In your opinion Mr. Dawson's rough estimate of 16 lakhs as the irrigable area is low?—Yes, I think there is a large area which could still be irrigated. Mr. Dawson has not a very intimate knowledge of the province. After a short service in it he went back to the Presidency and has only just returned. He was formerly in charge of the Karachi Division but does not know the province generally.

9. Q. In your statement "A" there is 1,270,000 acres shown as 'alienated'; that means jagir?—Yes.

10. Q. It is a very large proportion of the province?—With regard to the jagir land it has always seemed to me a pity that canals should not from the first be credited with full revenue. The whole canal revenue ought to be credited to the canals and areas which have been granted for political reasons should be a debit to their proper department.

11. Q. Until you have a perennial supply of course the rabi irrigation will be uncertain; but do you think it would be an improvement to try the perennial or *pakka* system of head-works purely from a *kharij* point of view?—The ordinary canals in Sind have no cold weather supply and you can never tell what the Indus may do at their mouths. Head-works in themselves are no protection as the river may leave them high and dry or erode them according as it wanders from one side to another. Until you have permanent heads you can have no certainty even as regards your *kharij* crops and, as a rule, no regular *rabi* supply.

12. Q. A weir here would not do any good to the Begari Canal?—No. The Begari owing to its situation has worked better—it has had less bad years and suffered less than most of the canals.

13. Q. Do you happen to know if the Engineers have got a project for improving the irrigation of the tract of country at the tails of the Begari, Sukkur, and Ghār Canals?—Yes. There are two alternative projects, viz., to increase the width of the Begari Canal, or excavate a new one to be called the Shikarpur Canal. I have written very strongly about it and I advised Government to send up an Engineer. It is very disappointing; the people have suffered for years from an unreliable and insufficient supply.

14. Q. All the available money has been spent on the Jamrao and Right Bank works?—Yes.

15. Q. There has been no large increase of irrigation (according to the statement) in the last 10 years?—That is quite true; we have had a good many bad years. 1897 and 1898 were very good years; 1895 and 1896 very bad years. We have had unusually bad years coupled with this drought, otherwise our area would have gone up very much. Then again the effect of the Jamrao is not included. In the first

year the canal irrigated only 11,000 acres, in the third year there were over 175,000 acres under cultivation and 4 lakhs of revenue. These last figures correspond to the project estimate for the seventh year. The ordinary estimate in Sind is that land is cultivated once in three years. The best areas in Sind are cultivated every year, but the circumstances vary enormously. I could name a whole taluka where the land is high (under lift) and is only cultivated once in four years; but in the north of the Hyderabad district, where there is a large number of wells with good irrigation every field is cultivated every year. There is a vast difference between different parts of Sind. In some places you have only to bring water to have the land irrigated every year.

16. Q. Is there well irrigation independent of canals?—Practically none. With regard to statement "E" "the area under wells," what is put down there as well cultivation undoubtedly gets its chief supply from the canals. Owing to the rise in the level of the water caused by the canals, I suggested that this should be altered and the area credited to the canals. Sir Evans James took a different view and therefore we left things as they were.

17. Q. Is there any feeling here that what is grown by the well is better than that grown by the canal?—Certainly.

18. Q. What do you put that down to?—The man who has a well will ordinarily be more careful. He has to be industrious to build his well. The cultivator practically resides in the fields. The outturn would be better than the outturn of a field under ordinary flow irrigation. If I were a zemindar myself there is nothing I should like better than to have a good tract of land irrigated by wells. I am always advising the zemindars to build wells.

19. Q. It is much more expensive for them? The flow rates are extraordinarily low?—That is a very big subject indeed. I have just recommended to Government that the rates for flow on the Mithrao Canal should be raised a little. Now that there is perennial irrigation there I don't think the lift rates too high compared with the flow rates; the lift produces a better crop. Under native rule the lift paid more because the outturn was greater.

20. Q. Nothing is credited to the man for his own cost of lifting?—We don't charge on wells at all. We treat wells as non-existent as regards assessment.

21. Q. The last column of the statements of cultivation on wells shows assessment of Rs. 54,000?—The rule is this. We assess land which is irrigated by wells exactly as if the well was not there. If it gets a flow supply we assess it at flow rates. If it gets a lift supply we assess at lift rates. We ignore the well altogether. For instance, supposing the *rabi* crop was irrigated with canal water at the end of the flood season and received additional water from the well, we should assess the field as if irrigated by the canal only.

22. Q. Would you generally advocate the deepening of canals for *rabi* irrigation?—That is too much of an engineering question for me. It strikes me that the canals might silt up.

23. Q. You are agreed that there is a very large area still irrigable and cultivable in the province and there is lots of water in the Indus?—Yes.

24. Q. Supposing you had money to carry out works would there be a difficulty about finding cultivators?—Yes, at first, but they would be forthcoming in time. The Baluchis on our frontier are hawling for land. Rajputana would also send us men. There is always a want of cultivators at first. When I went to the Jamrao last year, there were very few people to cut the crops, but that was practically the first year. You must allow time.

25. Q. You say money is given more liberally for canals by Government now than it used to be?—Yes.

26. Q. What is your opinion about private canals?—There are private canals all through the province. By assuming the entire management of the canals we have spoilt the people for the construction of new private canals.

27. Q. Are the private canals properly looked after?—Not always.

28. Q. Are they the private property of individuals or communities?—Communities generally.

29. Q. Are people anxious for Government to take them over?—They like keeping them until there is a dispute. We go on taking over canals. We have just taken over three important canals in one taluka.

30. Q. With your experience of Sind do you know of places now water-logged which used to be flourishing?—

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Mr. Giles. The best example of this is undoubtedly the Mithrau where water was given too profusely and a great deal of the land has become sodden and black from salt.

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31. Q. Has this last efflorescence done much harm?—It would be difficult to say, as there are always other areas available; but as cultivation and population increase in a taluka like this (Sukkur) with villages all about the salt lands are brought under cultivation.

32. Q. What is the population per square mile?—There are about 47,000 square miles and 3,200,000 of people excluding Khairpur. Large areas of Sind are hill and desert. Roughly speaking, half of Sind is culturable.

33. Q. Is the advance of irrigation here, as far as you are aware, hindered by want of establishment?—I think so.

34. Q. (*Mr. Ibbetson.*)—I understand, Mr. Giles, that in Sind as the Indus supply never fails, water is plentiful and therefore famine is unknown?—Yes, except in the desert. The moment famine occurs there the people all come in except a certain number, chiefly high caste Rajputs and a few others, and the consequence is that actual famine relief work is very little indeed. It is not conducted on Famine Code principles.

35. Q. Of course you have good and bad years. What do you suppose as compared with an ordinary year, the difference in the whole yield amounts to in the worst year you have knowledge of?—1895-96 was a very bad year; 1897-98 a good one. The difference in cultivation was 700,000 acres. The remissions represent only about $\frac{1}{10}$ th of the total loss to the country.

36. Q. At any rate though no famine is possible yet a bad year involves an enormous loss of yield to the people which presumably might be remedied by schemes for making more certain the supply?—Yes, certainly. It will never be remediable to a large extent except by a system where a permanent supply can be given. There is no permanency in the Sind Canals except the Sukkur Canal and where you have a sure supply.

37. Q. Then your system of assessment is a consolidated charge on the assessed area?—Yes, subject to remissions on poor crops assessed by the Tehsildar or Mukhtiar-kar assisted by assessors.

38. Q. Supposing that in a survey number the total area of which is 5 acres there was an acre of cultivation and four acres remained uncultivated, how would you assess the number?—We should take the assessment on the entire area of the number.

39. Q. Supposing the number was entirely uncultivated how would you assess it?—We should take no assessment subject to the limitation that after the number had remained four years in succession uncultivated, it would be assessed in the fifth year, whether cultivated or not.

40. Q. The assessment on the number in which there was cultivation would be subject to remission for poor crops?—Yes, even on the uncultivated number assessed in the fifth year remission would be given if from any reason such as failure of water-supply, cultivation was impossible.

41. Q. What is your scale of remissions?—If the gross produce exceeds twice the assessment no remission is given. If it does not, we take one-third of the produce.

42. Q. What proportion of the revenue is credited to canals?—90 per cent.

43. Q. Is that a direct or indirect credit?—It is a book credit.

44. Q. Do you know what share the Local Government takes?—I don't know.

45. Q. You tell us that private canals have been gradually absorbed?—Yes, there is still a certain number of private canals.

46. Q. Now in an area where Government is not prepared to undertake works for the supply of water, would it not be a good thing to stimulate the construction of private canals?—I don't think so. The people would not make them. They are all looking to us.

47. Q. You think nothing we could do would stimulate the construction of private canals?—No.

48. Q. Do we take a royalty for the use of river water?—No.

49. Q. Have you any power to authorise a canal being carried over the land of another man?—No. Neither do

we generally help them.—Yes, the Bombay Irrigation Act provides for such authority, but it is very seldom used in practice.

50. Q. You don't think this is an obstacle?—No.

51. Q. According to the Bombay Rule no revenue is taken for private improvements. How do you reconcile this with taking more than one-tenth of the usual revenue on land irrigated by private canals?—Most of our private canals take out of Government canals. Private canals from the river are almost unknown.

52. Q. My point is this do you think a liberal reduction should be given on account of enterprise in making or improving private canals. Do you think it would be a stimulus?—I would not recommend that for a moment.

53. Q. (*Mr. Higham.*)—There is a small reduction I see?—Yes, that is for clearance.

54. Q. (*Mr. Ibbetson.*)—I understand you to think that taking Sind as a whole two-thirds fallow is not an excessive estimate?—I think that would be about correct.

55. Q. Do you think that this large fallow area is due to want of labour?—Yes, I think so.

56. Q. As the population increases you may expect to see that diminish?—Certainly.

57. Q. Mr. Palliser seems to think that a perennial supply would not reduce the fallow irrigation?—I do not agree.

58. Q. You say wells are very valuable to supplement the canal irrigation in the *rabi*?—Yes, in certain areas.

59. Q. I understand that well irrigation is charged at the rates which they would pay for the available canal irrigation if they took it?—Generally so; if the land would ordinarily be irrigated by lift then the *khari* lift rate (the lowest rate of assessment) would be taken, and if by flow, then the flow rate.

60. Q. Is not that assessing private improvements?—If we were to assess it according to the lift *rabi* rate we should put on a couple of rupees at least. If you look at our table of rates you will see that this is the case.

61. Q. Practically then the well does get lower rates?—Certainly.

62. Q. I see from statement E that in 1896-97 there were 4,000 wells, in 1897-98 2,000 and in 1898-99 5,000. What does that mean?—The number of wells depends on the goodness or otherwise of the inundation.

63. Q. Does it mean the number of wells actually worked?—Yes.

64. Q. At any rate we have the fact that you have never reached a maximum of 8,000 wells in Sind?—No. This statement E is a statement of cultivation by wells only you ought to add the number of wells aided by canals—8,328. Take 1899-1900, 5,617 wells; in addition to that in that year there were 8,328 aided by canals, altogether that is 14,000.

65. Q. In the areas in which wells can be constructed moderately and can be worked at a profit is there much room for extension?—Yes.

66. Q. What could we do to stimulate that extension?—If you could do away with all the present complicated rules regarding takavi and allow us to give takavi on simple rules.

67. Q. What are the main points you would suggest?—I must refer to the present rules. When the Mukhtiar-kar has drawn a cheque it has to come back to the Huzur Deputy Collector for an endorsement of an order of payment. I should like to see one document which should form the application and the bond. That document should be given to the zemindar who should present it to the Mukhtiar-kar for endorsement as to the amount of land to be held in security. I don't think it is necessary to go thoroughly into whether the takavi is much needed or not. Some certificate is necessary. That being satisfactory the applicant takes his money.

68. Q. How long do you postpone the first recovery?—It depends. There are two systems of takavi grants under two different Acts. Under the Land Improvement Act, the postponement is ordinarily fixed with reference to the time when it is estimated that the improvement will begin to yield a return. Under the Agriculturists Loans Act, the postponement of the first payment is usually for 12 months.

69. Q. What is ordinarily the period of recovery?—Up to 20 years in grants made under the Land Improvement Act.

70. Q. Is that ordinarily given?—No.

71. Q. Why?—I don't think the Revenue officers are always as lenient as possible and in Sind few (if any) large works rendering long period advisable are carried out by private individuals.

72. Q. What is the ordinary period allowed for the repayment of, say, 300 rupees?—From five to six years.

73. Q. Would not lengthening that period promote applications for takavi?—I don't think so. With regard to takavi I am anxious to make another improvement. We used to give money for canal clearance under the Agriculturist Loans Act as being an ordinary recurring expenditure, but Government now insists on its being granted under the Land Improvement Act.

74. Q. Is the latter system more complicated?—Yes, money for ordinary clearance operations should not be treated as Public Works. Most of our money under the Land Improvement Act is given for canal clearance and very little for wells. I think it would be a very great advantage if we could go back and grant the former under the simpler system.

75. Q. Do you think having to pay 6½ per cent. makes much difference?—No.

76. Q. What security do you take?—Land, chiefly.

77. Q. The land to be irrigated by the well?—I was not thinking of the wells—the man's holding.

78. Q. Do you require collateral security?—Not generally.

79. Q. Do you insist upon registration?—That is according to the amount.

80. Q. Has a man to go to a registering officer to register the security?—No.

81. Q. Do you lend on the joint security of a village?—No—there is no village system.

82. Q. Supposing several land-owners came and wanted to borrow on their joint security, would you lend them?—Yes, I have got all the people to sign together but of course it has given an immense amount of trouble, but by that means I have got a canal cleared which they would not have done independently.

83. Q. There is no combination among them?—No.

84. Q. Has a land-owner any difficulty in sinking a well. Is he likely to come across difficult strata?—Yes.

85. Q. Should not help be given—boring tools, expert assistance or advice?—I don't think so. They have their own skilled men for wells.

86. Q. (Mr. Rajaratna Mdlr.)—Are remissions only granted in years of drought?—Remissions are granted when the crop fails for any cause for which the cultivator is not responsible.

87. Q. Every year it is granted? It is to be expected every year?—No. It is not expected, out of a whole taluka you will not get a single application.

88. Q. Do you grant remission for a 2-anna or a 4-anna crop?—If the value of the crop is less than double the assessment remission is given.

89. Q. You have no sort of classification?—No.

90. Q. The value is double the assessment?—Yes. Then Government takes one share and the zemindar takes the other two shares.

91. Q. Is the remission limited to a tract or to individual fields?—The individual field.

92. Q. Even though the surrounding fields may have less?—Yes. They would then be entitled to remission also. It used not to be so. The Remission Rules are absolutely the result of long experience.

93. Q. In statement E mention is made of "wells independent of canals"?—They are said to be so; I say they are not.

94. Q. I suppose all these well lands are commanded by the canal—they might get a canal supply?—I should say a very large number could.

95. Q. If canal water is used for one month and well water for the remaining period, do you charge?—We charge the ordinary rate. We generally charge the lift *kharif* rate.

96. Q. What would be charged if a field got assistance from a supply which belonged to Government?—We should charge according to the description of supply received, i.e., no more unless such supply was superior as, for instance, rabi lift from a canal. *Mr. Giles.* 6 Nov. 01.

97. Q. Are these well lands assessed independent of the canal?—In those cases where they are independent of the canal we still examine to see what the canal supply might be.

98. Q. Have you any information as to the number of wells constructed during the last ten years with the aid of loans?—No. There have been very few. The people making wells don't care for loans. They are generally careful men and I don't think they care to borrow.

99. Q. You said if the procedure as regards takavi advances was simplified and loans promptly granted there would be more applications?—Yes. I am trying to simplify the procedure and have called for reports from all Collectors. Before the applicants get the money into their hands there is great delay.

100. Q. Why don't people take the loans?—In the matter of takavi we are going along at a tremendous rate, as Return I (Revenue Statistics) will show, but the uncertainty as to grants forms a hindrance. Thus in the financial year 1897-98 Government was unable to give any grant to Sind.

101. Q. Would the appointment of a special officer for disbursing loans promote extension?—That is a question like many others that I have been thinking about. I think it might, but the worst of it is that he would be wanted everywhere, and often all that is necessary is a very little enquiry. One proposal has been put forward, which affects takavi, i.e., on certain fixed days, the mukhtiar kar should be in the kachari for the disposal of all personal applications or complaints, the fact being widely known. The takavi would then be given without any references to subordinates. The proposal is already known as "kachari" days, and there is no doubt that it would be an advantageous one. Sending a cheque to the Huzur Deputy Collector is simply ludicrous; it doesn't make things one atom safer.

102. Q. (Mr. Higham.)—Turning again to this question of fallows. I understand that when an estimate for a canal is made it is customary to take ½ of the area that will be brought under command as the area to be irrigated annually?—I think that is generally done. I should say that was the rule. I don't think though there is a rigid rule to that effect.

103. Q. Looking at the figures you have given to us, it appears there are about 7½ millions acres on the canals and 2½ millions irrigated only. Is it considered necessary that there should be a fallow two years out of three to save the land from exhaustion?—That depends upon the water-supply and the owners of land you are dealing with.

104. Q. If you have very good land and plenty of water there is no reason why you should not irrigate the same land every year?—Yes. There are large areas in Sind cultivated annually. Ordinarily rice is cultivated every year.

105. Q. In some parts they give rice land a fallow?—Yes.

106. Q. Is there room for increasing the irrigation in Sind, not by going into new tracts but by carrying out improvements on the existing canals?—Yes, to a very considerable extent.

107. Q. The ½ rule would not apply?—You would not get an exactly proportionate return by remodelling—say you doubled the area of supply I don't think you would double the cultivation.

108. Q. My point is this. To increase the total area in Sind it is not necessary to take up new lands or new territory?—No, there is a good deal to be done on existing canals; the remodelling, apart from extensions, will lead to larger irrigation of the area commanded.

109. Q. One of our witnesses said the people were very right in some cases to abandon lift irrigation if they got flow lower down. Have you known any cases of that sort?—I can give you an instance of abandoning lift for flow in the lands adjoining the Jamrao, e.g., the Taado Allahyar Taluka the cultivation of which is all under lift and the cultivators of which have been with difficulty kept from transferring their tenancy to the zemindars on the Jamrao.

110. Q. The difference between the rates of lift and flow appears to be very slight?—Yes, I am not surprised at your saying that.

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111. Q. What is the difference?—Here is a taluka with a lift rate of Rs 12 and flow 3-8. In Sukkur, which is a very good taluka, the rates are, flow 4-4, lift 3-8. Rice is more of course. The difference varies. If we had the population the lift would be the best because it does not render the soil water-logged, has better straw for cattle, and the people live in a happier way in their villages in the talukas where there is lift irrigation. Every Revenue officer will say that lift is better.

112. Q. Have you any idea what the cost of lift may be taken at?—The subject of the cost of lift has been dealt with at great length by different officers and is one regarding which I could submit statistics, but not give any definite figures off hand.

113. Q. I want to know whether you can explain on what considerations the lift rates depend?—The lift is a very sure supply. It never fails and never varies. They don't have troubles as regards flooding.

114. Q. You don't think it would be an advantage, as far as the people are concerned, to convert lift irrigation into flow. You think they are better off as they are?—Yes, I think so, but crops are raised with so much less trouble and labour under flow that limitation to lift would mean a great reduction in the food-supply. Moreover, it is only following an economic law that people should go where they can raise the largest area of crop with the least labour, e.g., when the ground only needs to be scratched and the water to be turned on.

115. Q. When the Rohri Canal was thrown out by the Irrigation Committee of 1892 were you on that?—No.

116. Q. One of the arguments in favour of the project was that it would give flow irrigation?—Yes.

117. Q. I think all the new projects substituted for it will not give flow?—It is rather a difficult thing to say for they are supposed to give a very considerable flow supply. I am very much inclined to doubt if they will give as much as is anticipated. I know lift areas where people cannot be got to take up the land, e.g., the Tando Allahyar Taluka.

118. Q. Anything to do with the rates?—Nothing at all. It would not be wise to say one prefers lift to flow. Either is very good for the production of grain in the country.

119. Q. If a weir were made at Sukkur it would reopen the question of the Rohri Canal?—Certainly. If the weir was possible, about which I know nothing, it would be magnificent in its results. In the first place the whole of the Khairpur State could be irrigated, then you come down to the Hyderabad District with its high lift lands which would all be irrigated by flow. The Dād and the Nasrat Canals would be abandoned of course as independent canals.

120. Q. The statements we have had regarding the weir deal mostly with the right bank. As regards the effect on the left bank we have not had any opinions?—You can get the whole matter from Mr. Joyner's report.

121. Q. Is colonisation now proceeding on the Jamrao?—I am just going out to see about it. None is proceeding at this moment.

122. Q. Why?—Because there have been difficulties about the supply, and the Colonisation Officer Mr. Robertson wrote in and said he thought we had better not go on with the colonisation until the success of the canal was more sure,

because if these colonists saw any deficiency they are apt to pack their goods and go home. The first 8 miles has silted a good deal, but it goes through a very bad bit of sandy country. But that in the opinion of the Engineers was to be expected and will gradually right itself. Then where we can we will begin colonisation again.

123. Q. You are now marking time?—Yes.

124. Q. How many colonists have you?—26 yeomen, 116 peasants.

125. Q. The irrigation that has been recorded has been mostly by the existing people?—Yes. To the local people we have given large areas of land.

126. Q. The colonists all came from the Punjab?—Yes.

127. Q. Has the question of rates on jagir lands ever been discussed?—The question of hakabo has been discussed as to what the rate should be, and it has been definitely fixed, for Kelat at 1-8 per acre.

128. Q. Is there any other case except that of Kelat? Yes, on Jagir lands in Sind irrigated by Government canals the rate on which varies from 10 annas to 5 annas per acre according as the cultivation is 'rice', 'flow' or 'lift'.

129. One rupee is what a zemindar generally takes as hakabo when he clears a canal.

130. Q. And he takes a share besides?—No, he takes nothing more for cost of clearance.

131. Q. There are some private channels on the Fuleli?—Yes.

132. Q. If Government made the distributary channels, water would be economised?—Yes, but it should be remembered that the canals had for the most part existed prior to Government taking possession of them, and that they had a vast net-work of private channels, i.e., distributaries from them which it would take an immense sum to re-make or remodel, and merely to build the sluices on their mouths means lakhs of rupees.

133. Q. In many places the water-courses run parallel to each other, so that each man may have his own channel; that leads to waste of water?—Yes, but the people object to being shareholders and insist on their right to separate channels. But in the Hyderabad District, where the old Inundation Canals are very bad and the clearances are heavy, the people would gladly have their channels cleared by Government. A very curious thing which I may mention as regards the irrigation in Sind is, that under the Irrigation Act the sluices are the property of Government which the people used to be made to make. Even now we try to get them to pay part, usually half of the cost. Properly speaking, the onus is on Government. The policy, however, is to leave things to work on as they best can on all existing canals.

134. Q. What do the sluices cost?—Anything from 200 to 1,000 rupees. If you put all these sluices in direct charge of the Irrigation subordinates, it would mean an enormous increase of establishment. It seems better to watch the new system on the Jamrao and see how it works and then on that experience improve. When canals are remodelled all the sluices are provided by Government.

135. Q. From what I have heard the colonists are not very satisfied. Why are they only brought from the Punjab?—That is the effect of the Chenab. Our colonist officer went to the Chenab and studied the work there and so sought his colonists from the Punjab.

Note.—The seventh and eighth days sittings were held in the Punjab, and the ninth to thirteenth days in Rajputana and Kathiawar.

FOURTEENTH DAY.

Ahmadabad, 2nd December 1901.

WITNESS NO. 8.—MR. BAHMANJI EDALJI MODI, Deputy Collector, Kaira.

Answers to printed questions.

I.

Mr. E. B. Modi.

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Paragraph 1.—The total area of the Kaira district is 1,021,372 acres and the total culturable area is 893,307 acres.

The area protected by Government irrigation works is 8,893 acres in one taluka—Matar—where the land is irri-

gated by flow from the Khari River. About 698 acres can be watered from the Khari River in Mehmabad taluka by lift.

The area protected by village works, namely, tanks, is 20,952 acres.

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The area protected by wells is 47,268 acres.

The soil of the greatest portion of the district is alluvial, while in the western part of Matar taluka the soil is black loamy, where rice and wheat are grown. There are also large tracts of land in some of the villages of Kapadvanj and Thasra talukas called the Mal; the soil consisting of black soil or white alluvial soil, is about two feet deep resting upon a concretionary bed of limestone. These Mal lands generally lie uncultivated.

If the rainfall is plentiful no artificial irrigation is required for the crops sown in the rainy season, even the superior kinds of rice which ripen about the beginning of November can do without irrigation.

When the rains fail in the beginning people raise seedlings of rice and bawta (*Eleusine coracana*) in prepared beds by well-irrigation, so that they may be planted out at the proper time. When the rains fail in the latter part of the season, rice is watered from tanks and wells, and in the villages commanded by the Khari from the water taken by flow from it.

The rainfall for the whole district is on an average 36 inches. In some years the maximum was so much as 60 inches and the minimum 16 inches. In 1899, the year of drought, there was not more than 4 or 5 inches of rain.

There is no demand for water in a year of ordinary monsoon. The superior kinds of rice which ripen after the end of the monsoon do require irrigation.

The crops which require irrigation are rice and tobacco. In some talukas rice is not irrigated, but the superior kinds require two or three waterings after the end of the season. In some places tobacco is not irrigated, but a large portion is irrigated about eight times during the season after the close of the rains. The yield of cultivated tobacco is generally double that of the unirrigated. The water of certain localities is specially suited to tobacco. Barley or jaw is irrigated generally with brackish water about 8 or 10 times during the season. Wheat is also irrigated if the soil is suitable, about four or five times during the season, and the yield is then three or sometimes four times that of the unirrigated wheat.

Juari is grown by irrigation during the summer chiefly for the sake of the fodder.

Sugarcane requires watering every ten days.

The other irrigated crops are the garden crops of onions, chillies, ginger, garlic, cummin, carrots, radishes, egg-plant, edible hibiscus.

Except in the Khari irrigation tract there is no control over the irrigation. People can draw water by lift from the rivers, and have, since the introduction of the Revised Survey in 1895, nothing to pay; they can also take water from the tanks, but have to pay the water-rates according to fixed scales when their lands have no water-rate charged already on them. Those who have wells in their own fields have not to pay anything; when they take water from wells in Government waste land, they have to pay a water-rate of Rs. 8 per kos for the season.

Paragraph 5.—Provincial irrigation works.—There is only one irrigation work which may be called the Provincial Irrigation work, namely, the Khari Irrigation. The Revenue is credited to Imperial Land Revenue. There have been no new works. This is an old work. The Khari is a small river and the water from it is taken by flow by 12 villages by turn, namely:—

- | | |
|---------------|-------------------------|
| 1. Kawra. | 7. Bherai. |
| 2. Kajipura. | 8. Govindapura (Inami). |
| 3. Pinglaj. | 9. Nacka. |
| 4. Pansoli. | 10. Navagam. |
| 5. Dhadhal. | 11. Kathivada. |
| 6. Malarpura. | 12. Chanidra. |

The river is divided into two branches at Pinglaj, the villages of Pinglaj, Pansoli, Dhadhal, Malarpura, Bherai, Govindapura, and Nacka taking water from the east branch by turn, while Navagam, Kathivada, and Chanidra take the water from the west branch.

Formerly there used to be earthen bunds put up in order to raise the level of the water, but subsequently wooden sluice gates were put up.

Before 1875 there were no works for regulating the flow of water into the two branches, and the result was that for many years the western branch carried much more than half the water, and the villages on the east branch used to suffer greatly, and in 1873 it was found necessary to give remissions of water-rates in the eastern villages.

The Chief Engineer, Irrigation, examined the locality and devised a plan by which the flow could be regulated. It was decided to throw half the water into the eastern and half into the western branch. Other improvements were also made.

No new Provincial work has been sanctioned.

There was a project for making the canal from the Mashwa River, and after a good deal of enquiry it was finally abandoned in 1893 as being unremunerative. It may be incidentally mentioned here that there is no water in this Mashwa River this year.

The revenue on account of the Khari irrigation is credited to the Imperial Revenue along with the Land Revenue.

Paragraph 6.—District or village works.—There are no district or village works except the village tanks.

These village tanks exist from old times, and the villages now and then repaired them; occasionally the District or Taluka Local Funds repaired some of them.

Strictly speaking, Government are responsible for keeping up these small tanks, but they do not seem to have done anything. In 1892 Government passed a Resolution that tanks irrigating more than a certain area should be kept in proper order by Government and appointed a special officer to examine and report upon these tanks; nothing, however, seems to have come out of it.

No remissions of land revenue are given when the works fail.

No new tanks have been constructed of late years.

There was a project for repairing the embankment of an irrigation tank, called the Panai, in the village of Dharora in Matar Taluka, but as the Inamdars of the village were too poor to contribute anything towards the cost Government would not take up the project. The village has suffered greatly in consequence.

It is desirable that District Funds should be expended on small tanks which Government will not look after.

The protective value of village tanks would certainly be increased by devoting more money and greater attention to their up-keep, so as to make them hold water for two years.

The local authorities may be held responsible for these works, but the increased revenue should be given to them.

Village tanks in this district are no doubt useful both for men and for cattle. The water is not generally used for drinking purposes, but people generally bathe in it. They are useful also inasmuch as the wells situated near them remain sweet owing to the percolation from the tanks.

Paragraph 7.—Wells.—The lands ordinarily irrigated by wells are as follows in five of the talukas:—

	Acres.
Matar	3,747
Mehmadabad	4,613
Thasra	450
Anand	3,953
Nadiad	9,682

The lands irrigated in 1899-1900, the year of drought:—

	Acres.
Matar	6,852
Mehmadabad	10,725
Thasra	403
Anand	11,743
Nadiad	17,775

The amount of takavi given in 10 years for the construction of wells is as follows:—

	Takavi.	Number of wells.
	Rs.	
Matar	3,145	17
Mehmadabad	24,625	123
Thasra	26,950	90
Anand	23,656	55
Nadiad	40,979	216

There are no concessions given to the constructors of wells except that no extra revenue is to be levied.

It is perhaps not quite possible, though it is desirable to stimulate the construction of new wells by more liberal advances. People do not think that they can make sufficient

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use of well water for irrigation; they do not feel sure of raising remunerative crops.

The lands that were in the sandy alluvial soil did not generally fail during the drought of 1899-1900, but those in the hard rocky soils of Kapadwanj and other talukas failed and held water for irrigation. They were not deepened.

The average depth of water below surface varies from 90 and 100 feet in villages near the Mahi River on the east of the district to 30 and 40 feet in the alluvial lands.

The cost of wells depends upon the depth and the diameter. Large wells intended for working 4 *kos* or leather bags cost from Rs. 500 to Rs. 1,500 according to the depth; wells of ordinary depth for 2 *kos* cost from Rs. 400 to Rs. 500.

The area served by one well is from 2 to 4 acres per one *kos*; it depends also upon the nature of the crop.

With regard to the possibility of finding artesian wells in Gujarat no definite opinion can be formed as our knowledge about the lower strata at a depth of, say, 500 feet is very meagre. Government should, however, make experiments in the lower tract between the peninsula of Kathiawar and Ahmadabad district, because it is very likely that the underground streams flow from north-east to south-west in Ahmadabad, and are meeting with the harder strata of soil in Kathiawar.

Paragraph 8.—Drainage works.—There used to be water-logging in several villages of the Matar taluka and in some villages of the Anand taluka. In 1830 it is stated the district was unhealthy and the crops suffered, and a system of drainage was carried out from 1831 to 1840, which greatly improved matters. The drain in Matar taluka had silted up about four feet and, owing to the representations of the Settlement Officer, who made the revision of the survey assessment, a scheme had been prepared. It was carried out as a famine relief work.

II. A.—GENERAL.

1. The answers relate to the Kaira district. I have been serving as District Deputy Collector for several years.

2. The average rainfall in each of the months of June, July, August, September, and October is as follows:—

	Inches.
June	3.63
July	8.33
August	9.79
September	6.23
October	0.10

1. Q. (*The President*)—You are Deputy Collector of the district of Kaira?—Yes.

2. Q. How long have you been stationed in that district?—Altogether about sixteen years.

3. Q. Then you know the district well?—Yes.

4. Q. Were you there throughout the last famine?—Yes.

5. Q. You have some irrigation works in Kaira?—Yes.

6. Q. I understand that they irrigate 8,900 acres?—Yes.

7. Q. But only a very small portion of the district is protected by irrigation?—Yes.

8. Q. I understand that the rainfall in your district has generally been ample?—Yes.

9. Q. What was your loss of population by famine?—About one-and-a-half lakhs out of nine lakhs.

10. Q.—With the experience you have had of famine, what measures would you take to protect your district from it in the future?—If we could make tanks that would hold water for two years, it would be advantageous.

11. Q. Do you think there is any reasonable belief that tanks can protect you?—I am quite certain they can. In the Kapadwanj and Thasra talukas where there are undulating lands, water can be held up for two years. There are also certain localities where wells would be a great protection. During the last famine, in June and July, wells were used for growing cattle fodder. The season had passed for growing it; it does not ripen in the cold season.

12. Q. (*Mr. Ibbetson*)—The people grow *juari* in the cold season?—Yes.

13. Q. (*The President*)—If there were tanks what would they water from them?—They would water rice.

14. Q. Rice only?—Yes, generally rice only.

In the other months there is practically no rain.

3. Is there any obstacle to the extension of irrigation arising from—

(1) Sparsity of population?—None.

(2) Insufficient supply of plough cattle?—None.

(3) Insufficient supply of manure?—Not much.

(4) Unsuitability of soil to irrigation?—None.

(5) Uncertainty of the supply of water, or its too late commencement or too early cessation?—The supply in the Khari irrigation work is not sufficient after the cessation of the rains for irrigating more lands.

(6) Lack of capital for the initial expenditure, etc.?—Capital would be coming forward if there is a certainty of profit.

(7) Fear of enhanced rent or revenue assessment?—No fear if irrigation is remunerative.

(8) Uncertainty of tenure?—None.

(9) There are no other reasons preventing the extension of irrigation.

4. Land irrigated from works constructed by private capital ought to be exempted for ever from enhancement of assessment under the present law. No alterations under the present law are required.

5. Loans are not taken freely under the Land Improvement Act for the extension of irrigation, because there are no facilities for irrigation.

Wells are made from takavi advances.

(1) There is no necessity to reduce the rate of interest,

(2) or to remit the interest,

(3) or to partially remit the advance.

(4) There should be total remission in case of failure to obtain water.

(5) The present period, 30 years, is sufficient.

(6) No grants-in-aid are necessary.

6. In this district the extension of irrigation cannot tend to injure the remaining cultivation by attracting the cultivators to the irrigated tracts.

15. Q. Is it a very profitable crop?—Yes. It is more profitable than any other crop.

16. Q. Is rice ever grown under wells?—No, but when there is scarcity of water in the latter part of the rains they sometimes use well water.

17. Q. That is in October?—Yes.

18. Q. When is the rice reaped?—There are two kinds of rice; superior rice is reaped in the beginning of November, inferior rice in the beginning of October.

19. Q. Does the superior rice crop suffer most in a year of drought?—Yes.

20. Q. Inferior not so much?—No.

21. Q. If tanks were made would the people be roused to take advantage of them?—Yes.

22. Q. They would not decline to use them?—No. During the last famine they utilized every small pond. They lifted water from these ponds and watered their rice crops.

23. Q. The dry crop is chiefly *juari*?—*Bajri* and *kodra* are also grown.

24. Q. Is cotton grown much?—Not much.

25. Q. What is *kodra*; is it a millet?—Yes.

26. Q. When is *juari* sown?—In July and August; it is grown chiefly for fodder.

27. Q. When is *bajri* sown?—In the latter part of June, or sometimes in the middle of June if the rains are favourable.

28. Q. If the crop is sown in June and the rains fail in September would it come to maturity?—*Bajri* is a very hardy plant and survives for a long time without any water.

29. Q. When is it cut?—In September.

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30. Q. (Mr. Muir-Mackenzie)—Is it reaped as early as September?—About the end of September; it depends upon the time when it is sown.

31. Q. In the case of an early crop?—If it is sown in June then it is reaped about the end of September.

32. Q. (The President)—Is tobacco grown on a large scale?—Yes. It is a very paying crop.

33. Q. Is it grown by well irrigation?—Yes, mostly under wells. A small proportion only is grown as a dry crop.

34. Q. You say there is only one irrigation work in the district which is classed as Provincial?—I made a mistake; I should have called it an Imperial work.

35. Q. Is the Khari irrigation work of great value?—Yes, very great. It was not of very great value during the past famine; because there was no water flowing, but in ordinary years it is of very great value.

36. Q. (Mr. Ibbetson)—It increases the wealth of the province?—Yes.

37. Q. Would you advocate its extension?—We have already made as much use of the water as we can. Formerly there was a special engineer for the Khari irrigation works, now it is under the Executive Engineer of the Ahmedabad district.

38. Q. You are using all the water that is available?—Yes.

39. Q. (The President)—The only way to increase the supply is by storage?—There was a project for bringing in water from the Mashwa river, and to have a storage tank near Bokh in the Ahmedabad district.

40. Q. In the famine year very little water was left in the village tanks?—Yes, all the tanks ran dry, the village tanks were especially dry.

41. Q. There must have been great difficulty in watering the cattle?—Yes, they had to be watered from wells.

42. Q. Was there great mortality among the cattle?—Very great; mostly owing to the want of fodder.

43. Q. You say that it is desirable that the District Funds should be expended on small tanks; has the district got any funds at its disposal?—Money has been spent from the Local Funds on small works. The Kaira District Board is very wealthy.

44. Q. Have any tanks been made by private individuals?—No.

45. Q. Is it looked upon as a religious act to make a well or a tank?—No.

46. Q. Has the last famine given a stimulus to the construction of wells; are people more inclined to make wells than before?—They have been making some wells.

47. Q. Has the number of wells increased?—Very much, chiefly on account of the liberal takavi advances made by Government.

48. Q. The people willingly availed themselves of these advances?—They did. It is possible that they maintained themselves to some extent, too, out of these advances. A cultivator who took Rs. 400 or Rs. 500 to make a well, perhaps kept about Rs. 100 for his own maintenance. We did not exercise any very stringent supervision considering the hard times the people were passing through.

49. Q. What interest does Government charge on these advances?—Five per cent.

50. Q. Do you think it would be a good thing for Government to advance money at a lower rate of interest, or even without any interest at all, in order to encourage the people to build wells; do you think that the people were prevented from making wells on account of the 5 per cent. interest?—I do not think so.

51. Q. You do not think it is a heavy charge?—No, of course they would be induced to come forward more largely if we remit interest and make greater advances of takavi; but as a rule they are not prevented from applying by our rate of interest.

52. Q. You say, "it is perhaps not quite so possible, though it is desirable, to stimulate the people." Is that on account of their ignorance and indolence?—They do not know what paying crops they could grow from wells; if all the land is irrigated for valuable crops they think there would be no market. Their idea is that if all were to raise garden produce it would become too cheap.

53. Q. You say that in some cases the villagers lift water from 90 to 100 feet?—Yes, that is the case in a village near the Mahi river.

54. Q. Is the water deeper near the river than elsewhere?—Yes, because the banks are very high; in some places they are 100 feet above the bed of the river.

55. Q. At what depth is the water below the surface which they irrigate from wells?—From 40 to 45 feet. In Kaira there is a town called Dākor where a good deal of garden crops is grown, the wells there are about 40 feet to 45 feet deep.

56. Q. Is there any uncertainty as to the proposed site of a well yielding good water?—That depends upon the tract of the country. In the centre of the district the people are generally sure of finding good water. But in the western tracts sometimes they get brackish water and sometimes they do not get any water at all at a depth of fifty feet. I know of a well which was sunk to fifty feet without water being reached.

57. Q. There is generally one well in each village?—Yes.

58. Q. It is used for drinking purposes?—Yes, but in some villages there are no wells; the villagers drink the water of the river.

59. Q. Before making a well do the people employ boring tools to see if water is obtainable?—As a rule they do not; they appear to know where to find water, and work according to old native ideas.

60. Q. Supposing the Collector of a district were to lend the people boring tools, would they use them?—I think they would. We had a boring apparatus, but we had no skilful workman to use it, so that we could not use it during famine.

61. Q. Do they do much in the way of *kachcha* wells?—No, except that in the year of drought and during a famine year, they made many *kachcha* wells out of the *takavi* advances.

62. Q. Do they last long?—For one year only, as a rule.

63. Q. Do they get *takavi* advances for *kachcha* wells?—Yes, about Rs. 40 or Rs. 50; they can irrigate about 2 acres by the *kachcha* wells in a taluka like Kapadwanj.

64. Q. In your district is a programme of relief works kept up to date by the Public Works Department?—Yes.

65. Q. Do you know if there was a programme of that sort ready when the last famine occurred?—There was, but it was quite insufficient to provide works for the large number of people that came on relief.

66. Q. When a man irrigates under a well is he charged the wet-rate assessment?—No; he is not charged.

67. Q. Not at all?—No.

68. Q. Never?—No, according to the Bombay Revenue system, if a man makes an improvement on his land, he is not charged any extra assessment.

69. Q. For all time?—Yes.

70. Q. That ought to be a very powerful inducement to the people to make wells?—Yes, very. During the revision settlement when the old survey assessment was revised, we charged land which was converted into rice lands according to the rice crop rate which is always higher than the dry-crop rates. Dry-crop land was in several places charged at rice rates although the land was converted at the expense of the owner himself into rice lands. They thought it was a breach of the promise made by Government that improvements by the people would not be charged.

71. Q. Has that always been the rule in the Bombay Presidency?—I think that was the rule when the Survey Act was introduced in 1865.

72. Q. You say that you think that the best way to prepare for famine would be to build tanks wherever it is possible?—Yes.

73. Q. What do you think should be done where it is not possible to build tanks?—Wells should be constructed.

74. Q. Would you have the wells made by Government?—That is a difficult question to answer. I think Government ought to make wells where they think it would be feasible and charge a water-rate. Formerly there were Government wells and when people took water from them they were charged at the rate of Rs. 8 per *kos*, and in some backward taluks at the rate of Rs. 5. I think that if the people took water it would be to their advantage, but it may perhaps not be profitable to Government.

75. Q. It would be an expensive business. I suppose that a well made by Government costs a good deal more than one made by the villagers?—No, my experience is that the Public Works Department can do it as cheaply as the villagers themselves.

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76. Q. (Mr. Higham)—Supposing Government build tanks, how are they to reconp themselves for their cost?—A water-rate of, say, Rs. 5 or Rs. 8 per *mot*, if they take water by a lift, or if they take water by flow, they might be charged a rate per acre for the area watered.

77. Q. You suggest a charge by *mot*; what would a *mot* irrigate?—About four or five acres where they regularly water.

78. Q. You would recover entirely by means of a water-rate?—Yes.

79. Q. You would suggest no increase in assessment?—No, because the people might not take water every year; they would take it only when necessary.

80. Q. The water-rate would only be realised if the people chose to take water?—Yes.

81. Q. Would it tend to greatly increase the value of land if tanks were established, and the people knew that water would be available in a year of drought?—I think it would increase the value of the land because they would be quite sure that there would be no failure of crops.

82. Q. You think they would accept the water-rate?—Yes, I think that the classification of the soil should not be changed. There are certain classifications and the rates are fixed according to those classifications. If there is a revision the classification will be changed, and the rates will be increased. The maximum rates for certain classes of lands is Rs. 4. Under the revision it may be increased to Rs. 5 or according to the rise in prices.

83. Q. The effect of making tanks would be that it would alter the classification of lands?—That should not be done; the classification should not be changed, but a general rise in the assessment of the different classes of land should be made.

84. Q. Would there be an enhanced assessment in case tanks were made?—Not on account of the tanks; but there will be an enhancement owing to a rise in prices and Government would be entitled to charge a water-rate.

85. Q. You suggest in your memorandum that District Funds should be expended on small tanks?—Yes, for tanks the water of which is supplied to the villagers.

86. Q. (Mr. Ibbetson)—For drinking water?—Yes, for the people and cattle.

87. Q. Not for irrigation?—No. Now and then money has been spent upon irrigation tanks.

88. Q. (Mr. Higham)—Very small amounts, I suppose?—Amounts of Rs. 500 or Rs. 600. Only when it is certain that Government will not do anything if tanks are made from Local Funds.

89. Q. It is the exception to make tanks for irrigation?—Yes.

90. Q. These tanks, I suppose, irrigate only a very small area?—Yes.

91. Q. And that in the neighbourhood of the tanks?—Yes.

92. Q. If irrigation is carried out under these tanks, can the District Boards charge a water-rate?—They have no power to do so.

93. Q. Then do you suggest that the District Boards should make these tanks and not charge for the water?—What I mean is that if these tanks are maintained altogether by Local Funds the water-rate should be given to the Local Funds.

94. Q.—They have now no powers to take it?—No.

95. Q. Government cannot take water-rate from tanks made by Local Funds?—Government do not charge anything because those lands which are under tanks are already assessed to wet rates. Water-rate is not shown separately, the land and water-rates are grouped together.

96. Q. (The President)—Do you think there ought to be only one rate?—Yes, if tanks are maintained permanently, then only I think water-rate ought to be charged.

97. Q. (Mr. Higham)—Do I understand you to recommend that the local authorities should make a number of tanks and that they should be given the difference between the wet and dry rates?—I should prefer Government to have charge of all tanks; but if small tanks are given over to the local authorities then the difference between the dry and wet rates should be transferred to the latter.

98. Q. Have the members of District Boards local knowledge of the districts?—They know their districts very well. The Board is composed of persons from different talukas, i.e., one man is elected from each taluka by the people themselves.

99. Q. There are also members nominated by Government, do they know the talukas well?—Yes.

100. Q. The members, I suppose, are land-owners?—Yes, they are generally village headmen.

101. Q. You say large numbers of cattle died from want of fodder?—Yes.

102. Q. Did they also die from want of water?—I do not think so; there was some water in the wells.

103. Q. Did the people take the cattle to the watering places?—In this district they have not to take them to any great distance; because in the Nariad taluka there are wells near the villages, and water was drawn from them for the cattle to drink, because most of the tanks were dried up.

104. Q. Was there any water available in the river?—Yes, the river was flowing, but it was at some distance. In the Sabarmati river water was flowing, but the people did not take their cattle to the river when it was distant.

105. Q. What is the rule about the maintenance of these tanks; are the people supposed to construct and maintain them?—In 1892 Government appointed a Committee to enquire into this very subject, and in 1895 they passed a resolution in which it was laid down that those tanks which did not yield a certain amount of revenue ought to be abandoned and left to the people themselves, and that the larger tanks should be taken up by the Engineering Department; but nothing was done in our district.

106. Q. I suppose after abandoning them no large sums were spent on them?—No.

107. Q. What happened during the famine of 1899?—We repaired many of the tanks.

108. Q. And spent money on them?—Yes.

109. Q. Was everything possible done for them?—Yes, during that time.

110. Q. They were all put into very good order?—Yes, most of them.

111. Q. Have you a programme of relief-works ready in case of emergency?—It is with the Public Works Department. It is very difficult generally to keep up a programme.

112. Q. Have you a programme ready now; suppose you should want it for famine relief works?—I have already made a programme of small relief works, and submitted it to the Collector because we require small relief works this year also.

113. Q. What are the powers of the Collector of the district in preparing a programme?—It is prepared by the Collector and sent to the Public Works Department for approval with regard to technicalities.

114. Q. The initial proposal is made by the Collector?—Yes.

115. Q. It includes all village works?—Yes. The larger projects are prepared by the Executive Engineer, Public Works Department.

116. Q. You mention that in the Mashvo river there is no water?—Yes, that is the case this year; last year also there was very little water; its bed is entirely dry at present.

117. Q. Was that the case throughout the monsoon?—I think in the beginning of the monsoon it was flowing, but I found it dry two months ago.

118. Q. You had a little water in the beginning?—Yes.

119. Q. The rains stopped early?—We had rains in the beginning of July and they stopped in August.

120. Q. After that no water could be got out of this river?—No.

121. Q. (Mr. Ibbetson)—What river do you refer to?—The Mashvo. But there is also the Vatrak river. In this, in ordinary years, there is a good deal of water flowing throughout the year.

122. Q. You had a good supply during the rains?—Yes. The supply in the rains never fails and could be used to fill tanks or depressions. The river is rather deep; and the banks are high in several places.

123. Q. How high?—About 15 or 20 feet, and sometimes 30 feet. Generally the level of the country is higher than the bed of the river; the banks in most places are generally very steep.

124. Q. (The President)—Is the land higher than the banks?—They are on a level generally.

125. Q. (Mr. Higham)—You say that wells if made would cost a great deal?—Near the Mahi river they would have to be very deep and would in consequence be very costly.

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126. Q. (Mr. Ibbetson)—Would you advocate large storage tanks?—Yes.

127. Q. Large enough to store a two years' supply?—Yes.

128. Q. Suppose you had got water enough for two years, and that in the first year the people had used half the water and were ready to use more; would you refuse to give them more water so as to provide for a possible famine?—No, we are not likely to have another famine for a long time. I should give out the water.

129. Q. Suppose you made a tank to hold a two years' supply; if the cultivation below the tank were to be extended, would you supply the new area with water out of your second years' storage?—We would not allow more land to be irrigated.

130. Q. Why not?—We would not know what kind of a year was before us; it might be a dry year, and we ought to be prepared for it.

131. Q. Would you refuse water for cultivation on the chance of the next year being a year of drought?—Yes. I would refuse to extend cultivation for fear of the next year being a year of drought.

132. Q. How many years of drought have there been within the last 30 years in Kaira?—Three years; 1877, 1899, and perhaps this year.

133. Q. You had two years of drought out of twenty-five?—Yes.

134. Q. There have been very few famines?—Yes.

135. Q. If you stored water in the hot weather for next year's cultivation there would be very great loss by evaporation?—But that would be calculated.

136. Q. Would you refuse water stored in tanks for new cultivation below the tanks on the chance of the next year being a year of drought which only comes once in 12 or 15 years, and notwithstanding the loss by evaporation?—Yes; we have suffered so much.

137. Q. You say that on the tanks they practically grow rice only?—Yes.

138. Q. *Rabi* crops might also be grown?—Yes.

139. Q. Would that be on the same lands?—Yes, after the rice is reaped.

140. Q. The crop is not nearly so good as that grown on separate land?—No, not so good.

141. Q. Why do they not grow the *rabi* crop on separate land?—The people take the chance of having two crops, generally.

142. Q. Would it not pay them better to have *rabi* on separate land?—No.

143. Q. Why is that?—The value of rice crop is considerable, and so rice is grown on every field they have.

144. Q. You say that in a famine year all the village tanks dry up?—Yes.

145. Q. Did you get any crop sown in the moist lands in the beds of the tanks?—I know of only one village, Alina, where crops were sown in the beds of the tanks.

146. Q. Are wells made in the beds of tanks?—In some places the people do make such wells; they take up water from *kachcha* wells in the beds of tanks and irrigate some of the lands. They get very sweet water in such wells.

147. Q. Do tanks affect the level of water of the surrounding wells?—Yes.

148. Q. You say the District Board is rich in Kaira?—Yes.

149. Q. In the famine year they had, I suppose, a very small income?—Yes.

150. Q. If they were well off why have they never done anything for the tanks in the district?—They have been repairing tanks used for drinking purposes for cattle. They have made no irrigation tanks. In very rare cases they have repaired irrigation tanks.

151. Q. Suppose a man wanted to make a well and the *bania* advanced money; what interest would he charge?—Nine per cent.

152. Q. (Mr. Muir-Mackenzie)—Not more than that?—At most 12 per cent.; the rate of interest is not very high here.

153. Q. It depends, I suppose, upon the class of the cultivator who wants to borrow?—Yes.

154. Q. (Mr. Ibbetson)—What rate would the ordinary cultivator have to pay?—Nine per cent.; sometimes they get it at 6 per cent.

155. Q. You think that the 5 per cent. charged by Government is no obstacle to the extension of wells?—I don't think it is an obstacle.

156. Q. Do you mean that if Government were to remit the interest to-morrow, people would sink more wells than if Government did not remit the interest?—One cannot be sure, I think if Government were to tell the people that they would be charged no interest they might be induced to make wells.

157. Q. Would many come forward?—Yes.

158. Q. You say you had boring tools, but that the people did not use them; was that because you had no experts to work them?—Yes.

159. Q. By boring tools do you mean tools with which you make a hole to test for rock before sinking a well?—We had an instrument called a "jumper." The people could not use it.

160. Q. Was the apparatus a drill with which a small hole is made to see whether rock is found, before sinking a well?—Yes. The natives too have such an instrument.

161. Q. Do they find them useful?—They are not much availed of. The people generally know where to sink a well. They do not, therefore, use these tools though they might prove useful.

162. Q. Do the people know of the existence of these drills?—Yes, there are native workmen in the villages who make borings in the bottom of the existing wells in order to tap better springs, but on the surface of the land they do not use boring apparatus.

163. Q. What size of hole does the drill make?—About 4 or 5 inches in diameter.

164. Q. You say that the people have not much confidence in the promise of Government that no assessment will be imposed upon improvements on their land?—Yes.

165. Q. Is there no law or rule exempting private improvements from assessment?—They feel that there is no guarantee that Government will not enhance the assessment.

166. Q. If the term of exemption were fixed at 30 years, would they be satisfied?—No.

167. Q. They would like to take their chance?—Yes.

168. Q. Rather than have a definite relief for so many years?—Yes.

169. Q. You suggest that Government should make wells and charge, say, Rs. 8 per *kos*?—Yes.

170. Q. You would not have Government make wells in private holdings without the consent of the holder?—No.

171. Q. Do you think the holders would agree to Government coming in and making wells on their lands?—Yes, they would; because they would have to pay nothing unless they took water.

172. Q. Would not the cultivator object to Government subordinates entering on their lands to dig wells?—I do not think they would object. They would be only too glad to have wells in their fields, because they would be quite sure that they could get water whenever they required it.

173. Q. They would rather have that than take money from Government and dig wells themselves?—Yes.

174. Q. What does a well cost?—Rs. 500, but it depends upon the diameter of the well and on its depth.

175. Q. Government would only get Rs. 5 to Rs. 8-8 per *kos*?—Yes.

176. Q. How many *kos* would a well have?—About four *kos*; two on one side and two on the other.

177. Q. Do you think that Government ought not to change the classification of the land; is not this the rule?—I think that is the rule now made; there is a general clause that on all improvements made by Government an extra rate is to be charged.

178. Q. There are many years in which a man is doubtful as to whether he will take water for his rice crop. Many men I suppose hold off from taking water in the hope of getting rain and refuse to take water, because they have to pay a rate?—Yes. The people might be induced to take advantage of the water if a reasonable land revenue were fixed. If that were the case they would take advantage of the water as soon as possible.

179. Q. Supposing Government were to allot to the District Boards a portion of the revenue or allow them to take part of the water-rate, do you think that they would do

Mr. B. E. any thing in the way of helping tank irrigation?—I think they would.

Modi. 180. Q. They could repair the tanks?—Yes.

2 Dec. 01. 181. Q. Scattered tanks and small tanks managed by the Public Works Department would be very expensive; do you think that the District Boards could do this useful work?—That is what I have suggested.

182. Q. Why do they not do it; I suppose there is no want of money?—They have to spend a good deal of money upon roads. We spend rather less upon tanks because we do not get any revenue from them.

183. Q. Supposing there is a legal difficulty about the District Boards doing this, do you think it would be a good thing to remove any disability that may exist?—I think it would be a good thing to charge the water-rate and to spend money from District Local Funds on irrigation works.

184. Q. For instance all those small tanks which Government has decided to abandon might be usefully repaired by the District Boards?—Yes.

185. Q. Would the tanks pay for their repairs?—I do not know, because in some cases very small areas are irrigated—only half acre or an acre or so.

186. Q. Are they for drinking purposes?—No; they are used for irrigation; they are far away from the villages.

187. Q.—I suppose a good many of them would pay; that is to say, the difference between the wet and dry assessment would be more than enough to keep the tanks in order?—Yes; I think so.

188. Q. Have you got a programme for village works?—Yes.

189. Q. Does that include small village tanks?—Yes.

190. Q. In a good year is water available in Kaira?—Not always, though there is always a demand for water.

191. Q. In an average year?—There is not a large demand, except for rice.

192. Q. The demand is only in a scanty year?—Yes.

193. Q. In ordinary years is the demand equal to the supply of water available in Kaira for irrigation?—I think it is a little less. The water is not used up except in the west of the district.

194. Q. That is your experience?—Yes.

195. Q. Have you got figures for the areas irrigated in 1899 and 1900?—Yes. Here they are.

196. Q. I see that the areas of fodder are doubled and in some cases trebled?—Yes.

197. Q. What was the reason for that increase?—All the cultivators tried to grow fodder as much as possible.

198. Q. In ordinary years wells might be used for irrigation?—Some wells were used.

199. Q. You say some wells were used?—Yes; many wells are not used in ordinary years.

200. Q. Why?—There is no demand. Gram is only grown to any considerable extent in the west of the district. They grow pulses, even though there are wells they do not use them.

201. Q. You are speaking of wells as well as of tanks?—Yes.

202. Q. The wells are sometimes not used at all?—Yes.

203. Q. Then it would be somewhat risky for Government to undertake the construction of wells?—Yes. The people will not sink wells because they are not quite sure that they will require well water always.

204. Q. Would they like Government to do it for them?—Yes.

205. Q. Are there many *kachcha* wells dug?—Yes.

206. Q. They were not all disused?—No.

207. Q. The area irrigated by *kachcha* wells is very small?—In some talukas, I think, it was very considerable in the famine.

208. Q. The cost is Rs. 50 for a *kachcha* well, and it lasts for ten years?—Yes.

209. Q. Is a leather bag and a rope included in the Rs. 50?—Yes, and they sometimes spend their *takavi* money in seeds also.

210. Q. What do you suppose to be the actual cost of digging a well?—About Rs. 10 to Rs. 15.

211. Q. You say the area served by one well is from two to four acres per *kos*?—Yes.

212. Q. It seems to me to be an extraordinarily small area?—Yes.

213. Q. What sort of crop do you get?—Tobacco, sugarcane, and vegetable.

214. Q. Does not the irrigation of crops like *juari* and *bajri* pay when it is from wells?—They do pay.

215. Q. At present it seems to me that all irrigation is confined to the richest crops?—Yes, but in soils which are suitable for wheat that crop is irrigated.

216. Q. Are *rabi* crops irrigated in this district?—Yes, in the Matar taluka wheat is irrigated, and the yield is two or three times the average yield of unirrigated wheat irrigated under wells.

217. Q. Suppose you were irrigating *rabi* crops by means of a well; how many acres would be irrigated?—I think from three or four acres per *kos*.

218. Q. If two or three acres of vegetable and rice can be irrigated, surely at least double that area of wheat should be irrigated; would not the area be very much larger?—It would not be more than four acres.

219. Q. Not more than that?—No.

220. Q. (Mr. Rajaratna Mdlr.)—In your memorandum you refer to rice lands irrigated by wells; what do you refer to?—I refer to dry lands made into rice lands by making bunds round the fields. The rate was increased upon those lands, because they were converted into rice lands and rice would be grown upon it.

221. Q. How many kinds of rice are there?—Two kinds. *Akashra* and irrigated rice.

222. Q. (Mr. Muir-Mackenzie)—In the Matar taluka, we have now passed an order to strike off the increased assessment?—Yes, on account of local conditions.

Mr. Muir-Mackenzie explained that a slightly increased rate is charged on new rice lands, but not nearly so high as on old rice lands. The difference was the same between that of old and new wells.

223. Q. (Mr. Rajaratna Mdlr.)—You suggest that the tanks may be handed over to the District Boards?—Yes.

224. Q. Would it not be better to hand them over to the villagers who are much more interested?—No, because there are very few cultivators. There would be only one or two cultivators who would be keen on the subject.

225. Q. If there were two or three they would be better interested than the District Boards?—They would not take them; they think that it is the duty of Government to do everything for them.

226. Q. Suppose you reduce the assessment by say 15 or 20 per cent. and hand the tanks over to them?—They would become more careless.

227. Q. Do you know whether the District Boards repair tanks which are used solely for irrigation purposes and for no other?—I think there are some tanks which are used simply for irrigation that they have not repaired.

228. Q. What was the objection?—The District Boards were not justified in repairing them, but out of pity for the people they have done it in some cases, as it would be a pity to allow old tanks to go out of repair altogether.

229. Q. The tanks had been used for drinking purposes?—Yes.

230. Q. In paragraph 1 you say that no water-rate is charged for water taken from a river?—Yes. Formerly the people had to pay what was called the *dhekhudi* cess. At the time of Revision Survey, Government thought it advisable to remit that cess for taking water from the river.

231. Q. Does that apply to all rivers, or specially to one river?—To all in the Kaira district; and if I mistake not, it is applicable to the Ahmadabad district also. There was a good deal of correspondence about it with Mr. Ozanne, Director of Agriculture, who was of opinion that no water-rate should be charged for taking water from the rivers, in order to encourage irrigation from them.

232. Q. In the same paragraph you make a reference about wells. Does that refer to Government wells?—They might have been made by Government. I say that the people who had been entitled to use water from these wells ought not to be charged a water-rate.

233. Q. Lands under wells according to the Bombay settlement are not liable to enhancement of assessment?—Yes, because the classification cannot be changed.

234. Q. Not at the end of the settlement period?—No classification can be changed.

235. Q. The classifications are never altered?—No.

236. Q. What then is this enhancement due to?—The general rise in prices and certain other considerations.

237. Q. If there were no enhancement under any conditions, would that give a stimulus to the extension of wells?—It would under the present settlement.

238. Q. You refer to a guarantee being given that there will be no enhancement. Do you think that that would result in further extension of wells?—There would be, but that would be practically a permanent settlement and whether it would be advantageous to the country or not I cannot say.

239. Q. Are any facilities given for the construction of canals by private capitalists?—No concessions except that nothing will be charged on account of improvements on the land.

240. Q. Suppose a canal were constructed from a river, would there be no charge for water?—No, not under the present law if made by private persons.

241. Q. That should be a sufficient inducement?—Yes, I think so.

242. Q. How is it then that there are so few canals?—There are no facilities for constructing them.

243. Q. (Mr. Muir-Mackenzie.)—In ordinary years the dry crop is pulse?—I think so.

244. Q. Is there a very large area under rice cultivation which is not commanded by tanks?—No.

245. Q. Some rice crops depend entirely on rain?—Yes.

246. Q. You think it would be a decided advantage if a very much larger proportion of area were irrigated by tanks?—I think so.

247. Q. If tanks were provided for rice cultivation, would they ensure protection against the ordinary fluctuation of the season?—Yes.

248. Q. For instance the rainfall in Kaira is between 16 and 60 inches?—Yes.

249. Q. In the year of 16 inches rainfall would not the rice lands, irrigated by tanks, have a considerable advantage over those which are not irrigated by tanks?—It would depend upon the capacity of the tank; if the tank were dry, 16 inches of rain would not fill it.

250. Q. Suppose in a year when 16 inches is the rainfall—that is not so bad as in the famine year you had only four inches and the tanks were not full—that the fall were distributed over the period of two months, would the tanks be filled up and would the water be of use to revive the dry lands?—I cannot say.

251. Q. On the other hand if the rice crops had not had the benefit of the tank they might have withered?—Sometimes it happens that with a little percolation rice lands retain a good deal of moisture.

252. Q. As regards ordinary years you say that rice is grown under tanks?—Yes.

253. Q. Then would it be fair to draw from that the conclusion that it would be advantageous in a famine year to construct rice tanks as a useful form of famine relief work?—We have been doing so.

254. Q. (Mr. Ibbetson.)—You are not making a single one this year because they are too expensive; do you not think it would be advantageous to make new ones?—I think the cost is too heavy. They would be very advantageous if we could dig them at a low cost.

255. Q. Having regard to the fact that they would give employment to famine labour, do you think tanks would be an advantageous form of work?—Yes.

256. Q. Perhaps you could spend your money better in maintaining old tanks than in building new ones?—I think so.

257. Q. (Mr. Muir-Mackenzie.)—Can you spend your money better in making new tanks than in making roads?—I think it would be better to make new tanks in suitable localities.

258. Q. New tanks for rice irrigation?—Yes.

259. Q. A great many *kachcha* wells were made during the famine year?—Yes.

260. Q. Were they made mostly from *takavi* advances or from money-lenders?—Mostly from *takavi* advances.

261. Q. In what month did the people take it—in November?—Early in October—the beginning of October.

262. Q. In your table of rainfall in Kaira you show that in October you had only 10 cents, and 6 inches in September, and practically none after that?—Yes.

263. Q. Therefore it was not possible to find out in September whether famine was imminent?—No. This year we knew by the end of September. In 1899 we had no rain in July, August, and September.

264. Q. In that year you had hardly any rain worth speaking of after September?—Yes.

265. Q. Therefore, if up to September, you had a very bad rainfall you could conclude that there would be famine?—Yes.

266. Q. Therefore, would it not be the best policy to begin distributing *takavi* from the beginning of October?—I think it would be.

267. Q. For *kachcha* wells?—Yes.

268. Q. As regards other wells could you tell us whether they irrigate from each well a larger area in famine year than in an ordinary year?—I think they do.

269. Q. In that area they grow principally fodder?—Yes.

270. Q. The loss of cattle was enormous?—Yes.

271. Q. The value of wells was very great in saving the cattle?—Yes; many people were able to save their best bullocks.

272. Q. In this particular district in which *kachcha* wells cannot be easily constructed, as soon as it is feared that famine is imminent, would it be advisable in good years to multiply the number of wells as largely as possible in order that the cattle might be preserved if a famine occurred?—Yes; it would be advisable to have a much larger number of wells.

273. Q. Have you ever heard of a system in the Kathiawar States where the State estimates the approximate cost of a well and gives the money to the cultivator who has to produce a certain amount of water—so much per *kos* or so much per acre. It would amount in practice to Government paying for a well while the cultivator constructs it?—Yes.

274. Q. Would you advocate the introduction of such a system here?—I think, it would be better if Government itself made the well.

275. Q. But the cost would be much greater?—I do not think so. I expect that the Public Works Department can build them at a fair price; I do not think that they would spend much, generally they make very *pakka* jobs. If they are made by the people themselves they would go out of repair in a very short time.

276. Q. Do you think it would be a good thing for the District Boards to be empowered by law to levy a tank revenue; would that stimulate the people to make tanks?—Do you mean making new tanks?

277. Q. I mean small rice tanks?—Generally, there are small hollows everywhere which can be utilized for growing rice. Such small tanks I think may be taken charge of by Local Boards.

278. Q. What do you mean?—Their repairs should be carried out by the Local Boards who could collect the revenue; they ought to be considered the property of the Local Boards.

279. Q. You say people have not perfect confidence that their assessment will not be enhanced if they make tanks. Why is that?—Up to this time the people have had very little confidence. But they are gradually getting to understand the policy of Government. They say that if they convert their dry crop lands into rice lands by their own labour they ought not to be charged enhanced assessment.

280. Q. You say they have been discouraged. Do you know what is the proportion of those rice lands?—No.

281. Q. In one taluka, the Chikhli taluka, they increased 40 per cent. of the old rice area by tanks?—I am not aware of that.

282. Q. Do you know whether there is any complaint about water-logged lands?—Yes; this year they complained. They say it is because the rains were not heavy.

283. Q. Do you think drains ought to be made?—Yes.

Mr. B. E.
Modi.
2 Dec. 91.

Mr.
Behechar-
das,

WITNESS No. 9.—SIRDAR BAHADUR BEHECHARDAS VEHARIDAS DESAI OF NADIAD.

Answers to printed questions.

2 Dec. 01.

Culturable and irrigable areas, &c.—Irrigation chiefly depends upon the season, condition of the soil and the nature of the crops to be irrigated. In the hot weather crops are watered every 4th or 5th day. But in ordinary seasons the interval between the two waterings varies from 6 to 15 days. The following are the principal garden crops and the average waterings they require:—

Ginger	20 waterings from May to January.
Turmeric	Do. do.
Surgarcane	34 to 40 waterings. 11 months during the year except in monsoon.
Suran	20 waterings from May to December.
Sweet potatoes	12 waterings from October to March.
Chillies	14 waterings from September to March.
Brinjals	14 waterings from November to March.
Onions	5 waterings in good season. More waterings are required in years when there are no late rains.
Garlic	15 waterings from November to March.
Tobacco	
Potatoes	

2. Sometimes it is feared that the extension of irrigation will tend to injure the remaining cultivation by attracting its cultivators to the irrigated tracts. The cultivation of garden crops requires something more than the mere presence of water though that is the chief thing. It requires a sufficient supply of manure, working cattle, suitable soil, capital for initial expenditure, &c., &c. Construction of wells in all fields or having a canal near by will not necessarily attract people to plant garden crops, to the neglect of the cultivation of ordinary crops. There are some cultivators, though few, who have got their own wells but cannot use them, either the water or soil being unfit, or having no such means as working cattle, manure, &c. But there are many cultivators who have got all the other means but not the water, because the construction of a well requires a good deal of money. It is for these cultivators that encouragement in construction of wells is necessary. If a canal passes through a district perhaps there will be a rush to cultivate land under that canal, leaving some waterless tract uncultivated. But there are no reasons why a cultivator should not try his luck in some better district if he has got means instead of spending his whole life in misery and labour. The land thus left uncultivated will be utilized by such cultivators who have not got means or enterprise. There is great scope for encouraging the construction of wells everywhere without anticipating any fears or difficulties.

3. It is quite essential to give liberal advances and inducements to encourage the digging of wells. Insufficient advances, delay in receiving them and stringent rules in recovering them prohibit a cultivator from taking advantage of the Government *takāvi*. He prefers a loan from a sowcar to a *takāvi* advance from the Government. As an inducement Government should recover only half the advance, and the remaining half should be written off. When a cultivator applies for the *takāvi* advance for the construction of a well, his field should be inspected by a Government officer, and in consultation with the cultivator, a place for a well should be marked out. When the necessary conditions for giving a *takāvi* advance are fulfilled, the requisite amount may be given to him. When the cultivator reports that the digging of the well is finished, the Government officer should again go there and give him a completion certificate. As soon as the cultivator shows the completion certificate to the officer who recovers the amount, half the advance should be written off and the other half recovered in due course. If such inducement is given, many cultivators will come forward to dig wells. Distributions of advances should of course be in charge of some high paid officer. On the other hand, in a place like Nadiad, where tobacco is, the chief garden crop, such inducements will not encourage cultivators to dig wells. Here the value of a well depends upon the quality of water it contains. There are some wells whose waters are well known for their manurial value. Cultivators, even at a great distance, take water from these wells. Lands watered from these wells do not require any manure, and can grow tobacco successfully for many years. Some of the

tobacco cultivators have means to dig wells of their own. But what they fear is the uncertainty about the quality of water they will get. If they get salt water they consider themselves fortunate. But if they get only sweet water their money is lost. Then they have to leave tobacco cultivation and try some other garden crops, which are not so remunerative. Instead of trusting their fortunes to such uncertainties they prefer to water their tobacco from old wells which are well tried.

4. In tracts where the water level is too deep, or the construction of wells is difficult, it is highly desirable that Government should undertake to construct wells. The place for such wells must be carefully selected. The owner of the land in which a Government well is constructed should have the free use of water, and other cultivators who take water from that well should be charged an ordinary water-rate for the use of the water. If the owner of the land afterwards wishes to purchase such a well, he should be able to do so after paying the full amount spent in constructing the same, and Government should forego all claims over the well. The owner should then be free to give water to other cultivators and charge them for it.

5. As a temporary measure cultivators dig *kachcha* wells to irrigate their crops. They are a protection against drought to some extent, but it is not permanently. *Kachcha* wells do not last long. No special encouragement is required, as *kachcha* wells do not cost much. They cost only labour. These wells are dug by the cultivators themselves with their home labour. It will be a good thing if local famine labour were employed in digging such temporary wells.

6. A good many wells which ran dry during the last famine were deepened and they got ample water. It is generally the practice to deepen a well which runs dry and it is sure to have more water. But in cases where quicksand layers intervene further digging is stopped, because the wooden *chakkar*, on which the whole construction rests, can be no longer pushed downward. Such wells are abandoned. The effect of the famine of 1899-1900 on the water level is remarkable. The water level has gone down from 3 to 7 feet, and, therefore, it operates very hard on the working cattle. The same bullocks are not now able to irrigate from the same well in a day the same area which they used to water some two or three years back. The average depth of water is 40 feet. The cost of constructing a well with one *kos* is Rs 300 and with two *kos* Rs 400. Three acres are generally irrigated by a well in ordinary years. In this district water from the wells is raised by ordinary *kos* or water bag. One *kos*, two bullocks and three men take from 3 to 4 days to water an acre.

7. Reports from Mr. Crimp, and other Geological officers, are rather discouraging as to the construction of artesian wells in Gujarat. This is a question of much importance and should not be shelved without complete inquiry. In Thasra, Kapadwanj, and other talukas, where the soil is of a different nature, artesian wells are feasible. Anyhow the trial of digging artesian wells is worth undertaking.

8. *Black soil.*—The black soil of Kaira varies from that of Broach. Small tanks constructed in this soil will hold water. High earthen dams can be made of it without masonry walls. In this district the greater part of black soil is under rice cultivation. In the season with a well distributed average rainfall, rice does not require any artificial irrigation. But in a year like the present, rice requires water. Being unable to obtain water either from tanks or wells, many fields are allowed to dry. In such a season cultivators water their rice fields with well water, if available, even at a high cost. There are some tanks already in existence in this black soil. Government takes a water rate from the cultivators for the area watered from these tanks. These tanks have not been repaired for many years, and as the nature of the soil is rather sandy, they are filled up with silt. They do not hold as much water as they ought to. Besides, Government leases them out to cultivate water plants such as singoda in the rainy season. Singoda requires much water and the effect of all this is that when the cultivator requires water for his drying crops he cannot get it, as by this time the water level of the tank has gone down. If these tanks are constructed for the use of the cultivators from whom Government takes water-rates, they must be repaired and they should not be leased out for the cultivation of singoda. As the rains in recent years have become very irregular the construction and repair of tanks

in the black soil is important and it will in future be remunerative.

9. *Government Irrigation Works.*—In the Kaira district water from the Mahi can be utilized for irrigation purposes in the large tract through which the Mahi passes, where the depth of water is more than 100 feet. It has already been suggested to have a storage lake. A storage lake is possible in the south of the village of Nandgamudra near Sastapur, where three small rivers meet. Water from this lake may be utilized 20 miles for irrigation where wells are scarce. It is highly desirable that works of such a nature should be provided from the Imperial funds.

10. *Drainage Works.*—There are many villages in the Kaira district where crops are injured by water-logging, for example, Narsanda, Vadtal, Karamsad, some villages in

the Thasra taluka, etc., etc. Additional drainage works, both on sanitary and agricultural grounds, are necessary to improve the health of the people and to increase the fertility of the soil. Fever attacks each and every man in these low-lying places. September and October are the chief months for the harvest of the kharif crops. During these months it is very important for a cultivator to watch his fields and see that all his crops are properly harvested and brought home. But unfortunately at this particular time he gets fever and he is obliged to leave his crops to the mercy of birds, rats and other animals. Sanitary drainage will not only improve the health of the villagers but it will also increase the income of the land. Drainage works will not increase the Government revenue, but there is certainty of recovering the assessment from the cultivators profited thereby.

Mr.
Behechar-
das.

2 Dec. 01.

1. Q. (*The President.*)—I understand that you belong to Kaira?—Yes, to one of the towns in the Kaira district.

2. Q. I believe you own property there?—Yes.

3. Q. You say that "In the hot weather crops are watered every 4th or 5th day?"—Yes.

4. Q. You refer, I suppose, to well irrigation?—Yes.

5. Q. You have no irrigation from tanks?—No.

6. Q. No channels?—No. In the Kaira district there are canals. In the Matar taluka tanks are not used for irrigation.

7. Q. Do you consider that irrigation is restricted on account of the deficiency of manure?—I believe that manure is needed, otherwise by annual waterings the soil becomes poor and will not yield a good crop. The soil in Kaira is sandy, and without manure good crops cannot be raised.

8. Q. Your village lost an immense quantity of cattle during the famine?—Yes, for want of fodder large numbers of the cattle died.

9. Q. What do you think would be the best measure to take to protect this district against another famine?—I have suggested to Mr. Ozanne and to other officers that one-fourth of the Government land that pays full assessment should be kept under fodder and grass and that the land should be charged half the full assessment; if the people cultivate that land then double the full assessment should be charged so that cultivators will be obliged to grow fodder on the land. The condition of the cattle would then be good and they could till the lands well and better crops would result than at present.

10. Q. Has this ever been done?—No; it has not been done.

11. Q. Would not grass be destroyed by want of rain?—No; I suppose that in the case of such crops they get some moisture from the atmosphere.

12. Q. You say "there is great scope for encouraging the construction of wells." Do cultivators find it easier to borrow from the sowcar?—They prefer the sowcar to Government, although the interest which Government charges is as low as 5 per cent.; but they prefer to pay a higher rate to the sowcar because they get money from him at any time they want it. They get money from the sowcar instantly. If they apply to Government for a loan it takes some time before they get it.

13. Q. How long does it take to get a loan from Government?—Not less than two months. The sanction of the Collector is required and other things.

14. Q. Has any money to be paid to anyone in order to get the loan passed?—I have no personal experience; but I have heard of many instances of that kind.

15. Q. (*Mr. Ibbetson.*)—Two months would not matter if a well was wanted and the cultivator had no bullocks to keep?—At present if a cultivator applies in March or April he will get the loan in June, which is useless.

16. Q. (*The President.*)—Would it be an inducement if Government recovers half the advance and remits the other half. Suppose a man borrows Rs. 400 and Government remits Rs. 200?—I think if the cultivator fulfils all the conditions half the money may be remitted, but it must be seen that the well is thoroughly completed and is used for agricultural purposes. Full recovery should be made if the well is not properly constructed.

17. Q. You say that "the water level is too deep." How deep?—Sometimes the wells are more than 100 feet

deep. At present it is very unsafe to dig a well in this part of the country; quicksand intervenes and does not allow the construction to go on any further and the construction of many such wells has to be abandoned. The Public Works Department in the Kaira district have, however, constructed two or three wells in which this has occurred. They have succeeded in digging such wells in these tracts; therefore I think such wells should be made by the Public Works Department from Imperial revenues.

18. Q. Suppose Government were to make such wells and the cultivator had to pay nothing for them; do you think he would use those wells for cultivation?—In the case of deep wells cultivators would not use them. The cattle cannot work them if they are more than 50 feet deep: pumps or some other means would have to be applied.

19. Q. After a well is made it is possible you might not find water?—Yes; last year, which was a famine year, I dug a well in my own fields and found no water; I therefore left the locality and went 50 feet further and dug another and there too I found no water. I spent Rs. 1,500 on those two wells and they are worthless. Quicksand comes in the way and you can get no water.

20. Q. It would be a good plan if some authority—the Collector of the district—could make a boring and say beforehand whether there is water?—At the time I dug my wells Mr. Quin was the district Collector; he lent me a boring machine but no one knew how to use it.

21. Q. Are you in favour of the extension of tanks in the district?—There are sufficient tanks, but they should be deepened and repaired. All the fields are charged sub-soil water rates and tank assessment has also been fixed on the surrounding fields. I have mentioned in my note that these have not been repaired for years. Every year the tanks are silting up more and the capacity for holding water is growing less.

22. Q. These are small tanks?—Yes, I am in favour of having more wells, just like those in Charotar. The people could use such wells.

23. Q. When the water is not very deep?—Yes; the water is deep only for five or six miles on this side of the river; in other parts you will find water only 40 or 45 feet deep. Therefore wells should be constructed where they are wanted and they should, I think, be constructed from Imperial revenues. One anna from the gross Imperial revenue should be put aside in the Kaira district and placed as regular Irrigation Fund, and from this one anna, wells should be built annually where they are most wanted so that the nature of the land will be improved and Government will not be obliged to lessen the assessment.

24. Q. When the water is very deep you think that Government should make the wells?—Yes.

25. Q. When the water is not very deep, say, thirty or forty feet?—Then also Government should make them; if it is left to the cultivators I am sure they will not make them. They will say "next year; now we are all right, why should we build wells."

26. Q. Will they forget the lessons of the famine?—They had lessons 25, 60, and 100 years ago. As soon as good times return they will forget the experiences of the famine.

27. Q. You refer in your memorandum to tanks?—I refer to small tanks under which rice fields are cultivated. Such tanks have been leased to the people; they are silting up and their capacity for holding water is decreasing. When the cultivator wants water for rice there is very little available though the lands under those tanks are charged water-rate.

Mr. Behekar-das. 28. Q. Would you put those tanks under the District Boards or would you leave them as they are at present?—Under the District Boards.

2 Dec. 01. 29. Q. Do you think they would be improved if they were placed under the District Boards?—Yes, assessment is already charged by the District Boards for repairing such tanks.

30. Q. Do you think Government can repair the tanks as cheaply as the people themselves?—I do not think so, Government repairing will cost double the amount which the people would spend in repairing tanks.

31. Q. (Mr. Ibbetson).—You would have Government make wells at its own expense where the water is at a reasonable depth?—Yes.

32. Q. What rate would the cultivator pay to Government?—Under Rs. 3 per acre, I suppose private owners are charging Rs. 2 an acre.

33. Q. You propose that Government should forfeit half its advance if a well is made properly and thoroughly?—Yes.

34. Q. You would have Government charge half the rate?—No charge should be made up to the time of the new revision of settlement.

35. Q. You say that when Government makes a well at its own expense the cultivator should be charged a water-rate of Rs. 3, but supposing Government advances money for making a well and remits half the advance, what should he pay?—I say that the water-rate should be charged separately.

36. Q. Would you say that half the rate should be charged when Government remits half the loan?—Yes.

37. Q. You think the cost of making a tank is twice as large if made by Government as it would be if constructed by the cultivators?—Yes.

38. Q. Would it not cost twice as much if Government made a well?—Wells require materials, bricks, etc.; tanks require only digging and the cultivator supplies his own labour.

39. Q. Do you think the Public Works Department could make a well as cheaply as the people?—I don't suppose so; but the Public Works Department makes such wells much more *pukka* than the people would and therefore the cost is greater. No doubt private individuals could make a well a little less expensively but the work is not sound.

40. Q. (Mr. Rajaratna Muller).—In the second case you propose that Government should make a well and charge nothing?—Yes, I refer to Inamdars' lands. Government can dig a well in the Inamdars' lands but cannot make a charge for the land in which the well is dug.

41. Q. Government would not dig a well and spend money over it unless the Inamdar wanted Government to do so?—If an Inamdar wanted it, then the land on both sides of the well will get out of cultivation and he should not be charged.

42. Q. Only so much of the land should be exempted?—Yes.

43. Q. I thought you propose that the whole of the land irrigated by the well should escape taxation?—No.

44. Q. That is not your meaning?—No.

45. Q. Supposing there are three acres of land under a well, do you maintain that Government should not only spend money in making the well but also allow the three acres to be irrigated free of charge?—Yes.

46. Q. Is not that a very large order upon Government?—To extend irrigation Government should dig wells of four *mots* so that 20 or 30 acres can be irrigated and the excess water can go to the adjacent fields.

47. Q. Why should the Inamdar get free irrigation?—Because ground has been brought under the construction of the well and is used by the well; and he will be deprived of the cultivation of the crop.

48. Q. Therefore the State should exempt him from assessment?—The Inamdar has not to pay any assessment.

49. Q. Do you advocate the reduction of the rate of interest on loans granted by Government?—Yes, to encourage the cultivator.

50. Q. Would you in that case remit half the advance?—Yes, that would induce the people to make more wells—more complete wells and no *kuchcha* and unfinished wells.

51. Q. (Mr. Muir-Mackenzie).—You think they would not do it unless they got that inducement?—Yes.

52. Q. (The President).—Would it not also be sufficient inducement for garden cultivation?—Yes, but garden crops sometimes fail in the cold weather; in one season they failed on account of the insects. Cultivators are not sure of getting a proper return everywhere; but it will induce people to make wells in times of drought and when rain is insufficient for watering the crops.

53. Q. (Mr. Muir-Mackenzie).—Supposing Government made wells, surveying the site and paying the cost and charging only the annual *bagayat* assessment. Do you think that would be an encouragement to the people to make wells?—Yes; but some of the rayats relations may die or there may be a marriage in his family, he may not take the benefit of the water; in that case he will have to pay the Government assessment all the same.

54. Q. Suppose Government remitted half, would that be an inducement?—Yes. If they have to pay assessment on wells they will not make them.

55. Q. In your village do you know of wells made on terms something like those I have described?—Yes, there are many wells there of which Government paid the whole cost. The cultivator makes the well and Government charge *bagayat* assessment.

56. Q. Government does not take cash assessment?—No. It only charges the cultivator for the gross produce in the field. The ground is divided according to certain rules. The charge Rs. 12, Rs. 8 and Rs. 5 per acre. Government can increase the rates every three years according to the fertility of the soil.

WITNESS No. 10.—Mr. P. R. CADRELL, I.C.S., Acting Collector, Panch Mahals.

Answers to printed questions.

Mr. P. R. Cadrell.

2 Dec. 01.

1. The answers below refer to the Panch Mahals district. I have toured throughout it. The district is divided into two portions, distinct from each other in climate, soil, and population to a degree which differentiates their requirements considerably.

2. The average rainfall per mensem is as follows:—

	Eastern. Inches.	Western. Inches.
June . . .	4.33	5.22
July . . .	9.82	15.32
August . . .	7.59	8.79
September . . .	4.64	7.33
October . . .	1.04	1.86

3. There are serious obstacles to the spread of irrigation, which are briefly as follows.

Western Division.—The principal objection is the character of the people. The mass of the cultivators are Kolis, extremely lazy and thriftless. The Kunbis are good and skilful cultivators, but they constitute under 4 per cent. of the population; and the Rajputs and Malis, who are fair cultivators, are not more numerous. These

classes take readily to well-cultivation, and this is the only form in which any extension of irrigation is possible. The country is too much of a dead level to allow of irrigation tanks commanding large areas; and, though it would be possible to make large storage works in the hills to the north, the cost of any system of irrigation therefrom would be enormous.

Irrigation is not generally desired by the people because the rainfall is nearly always sufficient. There has never been acute want in this division before the recent famine. Only, therefore, the superior cultivators desire irrigation to raise the richer crops.

The greater part of the soil is light *goradu*, containing much worn lime and granite, and rich wherever at all deep.

Eastern Division.—The character of the population, here, is again the chief obstacle.

The great mass of the population are Bhils, who, though not quite so lazy as the Kolis, are even more backward and thriftless. While the Koli indulges in opium, the Bhil spends all his spare cash in liquor. He raises in ordinary years both a kharif (maize) and a rabi (wheat or gram) crop on the same piece of ground and has sufficient for his

wants. Although failure either of the early or late rain is not uncommon, he is almost sure to get one crop and his assessment is extremely low. Water is ordinarily plentiful in a country of water-courses and steep hills. The tanks, however, naturally lie in deep hollows, and this fact, with the absence of any stretch of level ground, would render irrigation from them difficult. It would be easy enough to make large storage tanks by bunding up streams, and one is now being constructed.

The lack of capital is quite a minor objection and, as wells only could be constructed by private means, can be removed by takavi grants. The poorer cultivators require protection, but this has been provided by the restricted tenure.

4. No works except wells are constructed by private capital, and enhanced assessment is not levied on these.

5. Loans under the Land Improvement Act were not freely taken up before the scarcity, simply through the ignorance of the people about the system and because the sowcar dissuaded them from taking Government assistance. The system has now been thoroughly popularised by the grants during the famine, and the sowcar's influence has been much weakened. Government assistance will now be readily taken and will be at first necessary for those who have adopted the restricted tenure. I do not think that any reduction in the ordinary rate of interest is advisable. The margin between it (at 5 or 6 per cent.) and the interest on Government paper at $3\frac{1}{2}$ per cent. is not sufficient to allow of a special karkun in each taluka, and it is already far below the market rate of interest. I think, however, that as a special inducement a grant might be made of sums to be taken up, say, within five years, free of interest—in fact a special offer. I do not think any remission or grant-in-aid need be made, except to encourage backward classes who have accepted the restricted tenure, to make wells. Unless they have accepted this tenure any such remission would be a gift to the sowcar. I think, as stated below, that boring instruments and blasting powder should be supplied free; and on account of the special difficulties of the district, I think, the Collector ought to be empowered to remit in case of failure to find water.

6. On the contrary, what we want is to obtain cultivators for irrigated tracts, and a colony of Kunbis or Malis could be accommodated in several places.

7. There are no canals in this district. It is proposed to make one from the Mowalia tank now under construction.

23. There is only one irrigation tank in the district, the Malar tank, and the area from it is only 173 acres. The average assessment is from Rs. 8 to Rs. 10 per acre, and two crops are taken. The best rice (Sokhwel) is grown, while the ordinary rice in the district is of the coarser kind. The assessment is levied on the whole irrigable area.

There is also a small amount of cultivation by lift from village tanks, but this cannot of course be any assistance in a year of severe drought.

There is room in the Western Division for some extension of tank-irrigation but not very much for the reasons before stated.

34. (1) The average depth of *pakka* wells is from 15 to 30 feet throughout the district. The variation is caused by the presence of rock everywhere and the chance whether a spring is found quickly or not.

(2) The supply is from springs, except in the case of wells erected close by tanks, where it is by percolation. The wells very rarely become saline, but the spring of water is sometimes feeble. The spring would not be affected by one year of drought; but wells getting water by percolation naturally suffer in a dry year.

(3) The cost of construction is from Rs. 300 to Rs. 700, depending on the number of *mots* or lifts.

(4) The duration is for about 20 years, when the masonry requires renewal.

(5) The water is lifted by *mots* or *kos*.

(6) and (7). From 15 to 20 acres are commanded by one well and would all be irrigated except in years of heavy rainfall.

35. (1) Two crops are taken, except of course in the case of sugarcane. Rice and wheat would be the normal crop, the former being watered from the well only in its later stage. Vegetables are very generally raised.

(2) Sugarcane is grown and also the superior kind of rice.

(3) In a year of ample rainfall the first crop would not be watered at all from the well; in other years it would of course be assisted.

36. I am trying to get figures on this point.

37. Holdings are generally small and cultivated by their owners. In the Western Division enhanced rent on account of a well amounts to Rs. 20 or Rs. 30 per acre. In the Eastern, permanent wells are not known to have been rented. Only Rs. 2 or Rs. 3 enhanced rent is charged for a *kachcha* well.

No enhanced revenue is charged by Government on account of a well.

38. Serious difficulties occur in selecting the site of a well. The depth at which springs are found varies greatly, and when found, the spring is liable to run dry. Several of the Local Fund wells, though constructed solely for drinking purposes and therefore in low-lying spots, are quite dry. There are diviners who are believed in by some. They may have some eye for country, but their principal guide seems to be the smell of the earth and they are generally frauds. I do not know what expert advice could be offered, but I think assistance should always be given by the free loan of boring tools and the free grant of blasting powder.

In the Western Division, where there is black and medium soil, wells are difficult to construct; but this is not the case, apart from the necessity for blasting, in the Eastern Division, where even *kachcha* wells stand well.

39. I do not think Government should construct wells in private lands. The better cultivators will do it better for themselves, while backward ones would not use the wells properly and would thus find it difficult to pay the necessarily enhanced assessment. It is better to assist the more intelligent of the backward classes who want to help themselves.

40. *Kachcha* wells are unknown in the Western and are common in the Eastern Division. They are generally shallow, irrigating from 1 to 3 acres only, and are consequently useless in years of drought. If deepened however, they would form some assistance, and their deepening can be made a form of assisted village famine labour. Their extension should, therefore, be encouraged among the backward classes.

1. Q. (The President.)—You are Acting Collector of the Panch Mahals?—Yes.

2. Q. How long have you been there?—Since April last.

3. Q. You know Gujarat well?—Yes.

4. Q. You were in Gujarat throughout the last famine?—In early part of the famine I was in Broach.

5. Q. Your district is one which has very seldom suffered from famine?—Very seldom. The only record of severe famine that I can point to is that of 1790. The eastern part is liable periodically to slight scarcity.

6. Q. How did you get on in 1877?—Relief works were opened, but there was very little distress.

7. Q. What is the area of your district?—About 1,595 square miles.

8. Q. What is the population?—The population is 265,000.

9. Q. Do you know what the loss was during the last famine?—The census showed a decrease of about 16 per cent. in 10 years.

10. Q. Of the 1,595 square miles there must be large tracts of waste land?—About 60 per cent. of the area is cultivable.

11. Q. Is there much distress there now?—There will be more distress this year than last year, but not so severe as in the first year of the famine.

12. Q. What do you think would be the best form of protection against a future famine?—It is impossible to safeguard the country against famine by irrigation, but it is possible to increase the number of wells to a very limited extent.

13. Q. Why is it impossible to protect the country by irrigation?—Because the population is very backward, they would not take advantage of means for irrigating their lands.

14. Q. Are they Bhils?—Yes and Kolis.

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15. Q. Do they form the bulk of your population?—Yes; they compose nearly 90 per cent. of the cultivating class.

16. Q. If they had irrigation works would they not take advantage of them?—They would not.

17. Q. Would they if the water were given to them for nothing?—No, I do not think so because in ordinary years they get plenty of rain and get a very good yield.

18. Q. The scare of the last famine will not change their habits in that respect?—I do not think so, not permanently. It had a temporary effect on the Bhils who came on the relief works; but at first they would not even come on the works.

19. Q. You say the greater part of the soil is *goradu*?—Yes; it is light-coloured and highly mixed with gravel.

20. Q. Is it fertile?—Very.

21. Q. What was the form of relief works?—Principally tank excavation and enlargement of village tanks.

22. Q. (Mr. Ibbetson).—Existing tanks?—Yes; they are mainly for drinking purposes, and not for irrigation.

23. Q. (The President).—Is there any demand for wells?—No, except among the better cultivating classes who are only a small minority.

24. Q. The Bhils do not make wells?—Some of them build *kachcha* wells.

25. Q. Among the better class is there any desire for the extension of wells?—Yes; I think the number of wells will increase fairly largely.

26. Q. Do they take *takavi* advances?—Yes; during the famine they were given large advances, I know they would be willing to take them now. Before the famine they did not know of the system.

27. Q. (Mr. Ibbetson).—What was the proportion of the whole cultivating class of the people who took advances?—Not more than 10 per cent. of the total cultivating class. Their holdings were large.

28. Q. (The President).—You say that a well of two or three *mote* would irrigate 15 acres in an ordinary year? That is a large area?—That would be a well of 2 or 3 *mote*, 40 to 50 feet deep.

29. Q. Would it not be likely to run dry?—Not in a year of good rainfall.

30. Q. Is there any tank irrigation at all?—There is only one tank.

31. Q. I suppose that only irrigates rice?—Yes, and a small amount of sugarcane.

32. Q. You have a programme of relief works?—Yes.

33. Q.—Chiefly for the repairs of village tanks?—Yes, almost entirely. There is one large work at Mowalia going on now and another is proposed.

34. Q. Is that a large tank?—Yes.

35. Q. What is the scope of the work?—It will irrigate 5,000 acres.

36. Q. Is the work well forward?—Yes.

37. Q. Was it commenced in the last famine?—Yes; three and a half lakhs have been spent on it already.

38. Q. What is it called?—The Mowalia tank.

39. Q. How many people could you employ on that work if occasion arose?—Up to 10,000; about 3,000 are now employed on it; the canal will have to be six miles long. The line runs up to Neemuch.

40. Q. I suppose the loss of cattle was severe during the last famine?—Very large; we gave Rs. 20,000 for cattle in *takavi* last year; the people had to bring cattle from the breeding grounds.

41. Q. Where are the breeding grounds?—In Malwa.

42. Q. Did the Bhils suffer in respect to their cattle?—Yes; they suffered severely.

43. Q. Are they a wandering tribe?—No; they live in huts, scattered.

44. Q. (Mr. Higham).—What is the culturable area in the Panch Mahals?—About 663,000 acres.

45. Q. Is there tank and well cultivation in the district?—There is no tank cultivation; there is only cultivation from wells and that is not more than two per cent.

46. Q. Did the wells work well during the famine of 1899?—Most of the wells worked pretty well; a few failed.

47. Q. I suppose the wells which were made in 1899 dried in the following year?—This year they are nearly all dry; this has been a very bad year for wells.

48. Q. What happened in the first famine year?—Most of the wells held water.

49. Q. I suppose the area irrigated by them was not sufficient to materially benefit the district?—I do not think it made any difference. The lands irrigated by these wells belonged almost entirely to the better class of cultivators, and they were not in very great distress throughout the year.

50. Q. They did not come on relief works?—No, not the better class of cultivators. It did not make any difference to them.

51. Q. Did they give employment?—There was no great demand for labour on the site of their holdings.

52. Q. Was the Mowalia commenced in this famine?—Yes.

53. Q. It is not an old tank?—No; the work is not yet completed.

54. Q. When will it be completed?—It will be completed in April if the number of labourers employed on it is 5,000.

55. Q. Are sluices being constructed?—They have not been constructed yet.

56. Q. Has money been provided for making them?—I believe so; it is in charge of Public Works Department.

57. Q. The Malao tank is an old tank?—Yes.

58. Q. How long ago was it built?—Many years ago.

59. Q. Is it a large one?—It irrigates about 130 acres.

60. Q. Is the water in the tank taken every year?—Yes, every year.

61. Q. Do they pay water-rate?—Yes.

62. Q. Have you a fairly steady demand for water all the year round?—I am afraid I cannot say; the Assistant Engineer will be able to tell you.

63. Q. (Mr. Muir-Mackenzie).—All the cultivators under that tank are Kunbis?—Yes; Kunbis and Malis.

64. Q. (Mr. Higham).—In the relief programme do you enter *kachcha* wells?—Not in the programme; but grants are being made for making *kachcha* wells by famine relief labour.

65. Q. The grant covers the whole cost?—Yes. A grant of Rs. 50 is made to the Patel of the village, and he is responsible for its expenditure.

66. Q. Is that amount recovered, is it treated as an advance?—No. The well is for drinking purposes and not for irrigation.

67. Q. Are the wells made specially for drinking purposes only?—No, the same wells can be used for irrigation; but they are not called famine works.

68. Q. Is there any objection to calling them famine relief works?—No, none.

69. Q. If a man wants to make a *kachcha* well can he get an advance?—Yes; he gets *takavi*.

70. Q. How much?—From Rs. 50 to Rs. 100.

71. Q. The grants are made to the Patel and he supervises the work?—Yes and he sees that the work is carried out.

72. Q. He pays for the labour by piece or so much a head?—He pays so much a head and is bound to employ so many people; he is also bound to keep a rough register showing how many people he employed and how much he paid.

73. Q. The Public Works Department have nothing to do with it?—No; nothing.

74. Q. Can you tell us anything about the expenditure on account of relief works in the Panch Mahals during the last famine?—The figures which I have show that Rs. 4,64,000 have been spent.

75. Q. These figures include the Mowalia tank?—Yes.

76. Q. Were other tanks taken in hand?—Yes.

77. Q. Are they being completed?—Yes; Rs. 1,20,000 have been spent on village tanks, i.e., village works done by

Civil Agency and Rs. 3,40,000 on works done by Public Works Department Agency.

78. Q. The village tanks are made by Civil Agency?—Yes.

79. Q. Do they hold water?—They held no water this year, because there was no rainfall.

80. Q. (*Mr. Ibbetson.*)—You say that a big tank is being made now?—Yes.

81. Q. And that there is a proposal for another?—Yes.

82. Q. Will the lands they irrigate be held by the better class of population?—Yes; the tank near Goona is in the hands of the better class of the population.

83. Q. And the other?—We have not selected a site for the proposed tank.

84. Q. You think the Bhils would not take advantage of irrigation even if they got the water free?—They have no experience of irrigation, and they do not want it because with ordinary rainfall they can get two crops from their lands by simply scratching them. In ordinary years I doubt whether they will take to irrigation.

85. Q. It comes practically to this, that it is a hopeless task to try and protect this population?—I think it would be a hopeless task to try and protect them by irrigation works.

86. Q. As regards the better class you suggest that as a special inducement loans should be made for five years free of interest, you expect only the better class of cultivators to take *takavi* for wells?—Yes.

87. Q. Supposing you tried that experiment, do you think a large number of wells would be made?—I think the number of wells in the district will be doubled.

88. Q. What would be the cost of a big well?—From Rs. 300 to Rs. 700; a good well could be made for from Rs. 500 to Rs. 700.

89. Q. What area would such a well irrigate?—A well of two or three *kos* would irrigate from fifteen to twenty.

90. Q. What water rate should Government charge?—Government should charge nothing if the well is made from *takavi* advances?

91. Q. Government would lose interest and get no return except that it is carried out as a protective measure?—Yes.

92. Q. Are there a large number of wells in your district that are not used in ordinary years?—In a year of good rainfall many are not used at all.

93. Q. Have many fallen into disuse?—No; I do not think so. They do not get brackish in this district.

94. Q. You don't think that these wells on which Government sacrifices its money fall into disrepair for not being used?—I do not think so, they would be used every second year.

95. Q. I see that in the Malao tank you charge Rs. 10 an acre for irrigation?—That includes land assessment.

96. Q. That is a consolidated charge and not merely a water-rate?—No.

97. Q. Do you get all your water used at that rate?—I could not say.

98. Q. What crops are raised?—There are two crops raised, the ordinary crop would be rice, followed by wheat or gram.

99. Q. In the same ground?—Yes.

100. Q. In a case like that, would a man put the whole of his holding under rice?—Yes; I believe so.

101. Q. And wheat or gram to follow?—Yes.

102. Q. Is it manured?—Rice crop is not much manured, except in the seed-beds.

103. Q. What does a well that has three *mots* cost?—About Rs. 700.

104. Q. The rate per acre irrigated by such a well would be from Rs. 5 to Rs. 7?—Yes.

105. Q. You speak of boring tools. Do you mean drills for trial borings?—Yes; they are being tried, but I have no experience of them.

106. Q. Have you had large experience of the *takavi* system in Bombay?—Yes, in various districts.

107. Q. Do you think that the 5 per cent. that is charged on advances is any obstacle?—No, I think it is extremely low.

108. Q. When do you begin to recover *takavi*; how long after the loan is given?—Generally with the first land revenue collection, in the next year.

109. Q. A well would not be in full working order by that time, the work will not be complete?—I think it would.

110. Q. You mean to say that it would be completed between the time you give your loan, and the first revenue collection?—The man would not have to pay the first instalment till the next year.

111. Q. Could he make a masonry well in that time, fit it out and get the area fully irrigated?—I cannot say.

112. Q. (*Mr. Muir-Mackenzie.*)—Is there not a provision in the rules allowing that the first instalment should be postponed till the well is brought into working order?—I am not sure.

113. Q. (*Mr. Ibbetson.*)—How long do you take to recover the *takavi* for wells?—The Collector fixes instalments up to ten years.

114. Q. Is that the limit under your rules?—Yes.

115. Q. It cannot be under ten years?—I do not know of any case.

116. Q. Ordinarily you get the whole of the advance back in ten years?—Ordinarily in eight years.

117. Q. I see many people recommend small instalments which would make the period of recovery much longer; do you think ten years too short?—I do not think ten instalments acts harshly upon the people.

118. Q. What is the security in the case of a *takavi* loan?—The man's land.

119. Q. The land to be irrigated?—Yes.

120. Q. You don't demand collateral security?—No.

121. Q. Security on any other land?—No.

122. Q. Is the bond registered by which he pledges his land?—No.

123. Q. Suppose, owing to a bad year, a man meets with failure do you suspend the instalments—do you show him any leniency?—No.

124. Q. Supposing he does not find water or that he strikes brackish water, is there any provision for remission?—No, not at present.

125. Q. Do you think that such a provision would lead to a sort of gamble with Government money. Might not a man say, "if I don't find water Government pays, I don't wish to take any risk?"—It would make him more willing to take the risk. I do not think it would be gambling with Government money.

126. Q. On sites which have been approved by Government after trial borings if a well does not succeed, you would remit three-fourths or the whole of the advance?—I think Government should bear the whole loss.

127. Q. We have been told that people are deterred from making irrigation works by the fear that they will be assessed enhanced rates; is that your experience?—I have never heard of it.

128. Q. Do you think the prospect of enhanced assessment enters into their calculations?—I think they are not quite certain of getting their lands which are with the Sowcar or the Marwari.

129. Q. Do you think that deters them?—Yes.

130. Q. What is there to diminish their confidence?—The restricted tenure I think.

131. Q. Have you any experience of Local Board management?—No; I have not.

132. Q. Do you think Local Boards should look after small scattered tanks and that the larger works should be undertaken by the Public Works Department?—I do not think so.

133. Q. If a new work is made by a private individual Government will not charge on it; and if it is made by the Local Board it would seem only fair that they should get the income?—Yes.

134. Q. Supposing they had an income of that sort rendered available by Government relinquishing to them the revenue; do you think any scheme of that kind would succeed?—I think it is quite impracticable.

135. Q. I am speaking of a case in which Government is not prepared to get the work done by the Public Works Department; the works being too small. Do you think that the Local Boards would push on the works if Government provided the means. Do you think there is any hope of their doing so?—I do not think so.

136. Q. You don't think there is much hope in that direction?—No; I think there is not. The Local Board is practically under the management of the Collector and the Mamlatdar.

Mr. P.
Cadell.

2 Dec 01.

Mr. P. R.
Cadell.

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137. Q. (Mr. Rajaratna Mldr.).—You say there are several rivers in the Panch Mahals. Why not utilize them?—They cannot be utilized. Several rivers go through the district.

138. Q. There are three rivers in the Western Mahals?—Yes.

139. Q. Could none of these rivers be utilized by any means?—I do not think so.

140. Q. *Kachcha* tanks are recommended in your printed note; have you any idea whether they would be of any use in the Panch Mahals?—Yes; one very good tank has already been made this year; they are recommended because they would raise the water-level and be beneficial in various ways. I think tanks, to a limited extent, ought to be made in the eastern part of the Panch Mahals.

141. Q. Considering the characteristics of the people and the fact that your dry crops pay well, what would you recommend as the best means of protection against famine. Should *kachcha* wells be encouraged?—I do not think there would be any effectual protection by them; they are only shallow wells.

142. Q. They would serve no purpose in a year of drought?—For one year of drought they would.

143. Q. Would people take to the construction of these wells if facilities were given in the shape of granting loans through the medium of specially appointed officers?—We would have to be very quick about it; it is very difficult to know whether there will be a drought in the first year of scarcity.

144. Q. If you appoint a number of special officers, one for each taluka, could you not prevent famine?—You might.

145. Q. What area would a *kachcha* well irrigate?—A *kachcha* well will not irrigate more than one to two acres.

146. Q. Would that be useful?—Yes; but you have to be very quick about building it.

147. Q. Suppose a *patta* is given to the rayat guaranteeing present exemption from enhancement, and guaranteeing also that at the next Revision Settlement the land though liable to some enhancement on general considerations, based on rise in prices, etc., would not be liable to be enhanced on account of improvements made by him; would this stimulate the extension of wells?—Yes.

148. Q. Suppose you grant him a permanent *patta* exempting him from all future enhancement?—That would be a very undesirable principle; it would be putting Government to a loss to a certain extent.

149. Q. It has been recommended by the Famine Commission. Would that induce the people to extend the construction of wells?—I do not think so; there are many rayats sufficiently provident; it may have some effect, but I don't think it will have much effect. Any such measure is very undesirable in the Panch Mahals, as the assessment there is extremely low.

150. Q. In para. 6 of your printed note you refer to colonization. Would it be possible to arrange such colonization in the Panch Mahals?—In this district Kolis are numerous, and it is very hard to get them to co-operate. We have tried them, but they say it would interfere with their *nyat* and marriage arrangements; it is very difficult to secure their co-operation.

151. Q. (Mr. Muir-Mackenzie).—What crops are the tanks expected to irrigate—rice?—Yes; and cold weather crops.

152. Q. You do not think that the Bhils and Kolis would be induced to take water from the tanks for rice?—They don't want rice, they grow maize to eat and wheat and gram to sell. Rice cultivation means more labour and better bullocks.

153. Q. What class of work would you recommend in the Panch Mahals as famine relief?—I think there is nothing to do, but to arrange for village tanks.

154. Q. Would that suffice?—Yes.

155. Q. Don't you think it would be a good thing—just as a matter of experiment—to make some irrigation tanks?—That experiment is being made in the Mowalia tank. Another tank will also be made.

156. Q. On the Mowalia you have Kunbis to cultivate?—Yes, the land is held by Kunbis.

157. Q. Are a great part of the Bhils' lands held by Sowcars?—No; not much.

158. Q. You do not think that the prospects of irrigation would be affected by the sowcars?—The sowcars would take the lands and gradually these lands would pass out of the cultivators' hands.

159. Q. Do you think the sowcars would be tempted to bring in good cultivators from outside?—I do not think so; I have not heard of their doing so yet.

160. Q. Are there many disused tanks in the Panch Mahals—old ones and unrepared ones?—I do not think so.

161. Q. Are there any disused wells in the forests?—Yes; in one part—Champaner. There the land in the forest is out of cultivation.

162. Q. You say that village tanks are useful for famine work; would it be equally useful to make long bunds?—I think they would be just as useful as village tanks; because village tanks are used for drinking water, and storage tanks could be used for drinking purposes.

163. Q. I mean long bunds like those you have in Anand and Viramgam to hold up surface water for wheat and irrigate rice below?—That would only be possible in the Western Mahals, where the country is level.

164. Q. Within that country they might be used?—Yes; I think they might be used.

165. Q. Have you any suggestions to make as regards providing greater facilities for taking *takavi* advances?—I think they should be given with greater expedition than at present.

166. Q. That would require the maintenance of a considerably larger establishment than exists?—No; one or two more Karkuns from the *kacheri* of each taluka.

167. Q. Could not the Circle Inspectors distribute *takavi*?—They don't give *takavi* at all, they simply inspect works.

168. Q. They make inquiries as to the security of the man?—No; not the Famine Circle Inspectors. That is done by the ordinary Circle Inspector.

169. Q. They have done it in most cases since the famine came on?—Famine Circle Inspectors did.

170. Q. At any rate do you think they would be usefully employed in making these inquiries, or do you think that the work should be left to other officers?—I think it would be better for the Karkun to report direct to the Mamlatdar.

171. Q. Have you seen water-logging in the Panch Mahals?—Never.

Mr. K. G.
Desai.

2 Dec. 01.

WITNESS No. 11.—Mr. K. G. DESAI, Executive Engineer, Kaira and Panch Mahals.

Answers to printed questions.

GUJARAT.

Paragraph 2.

- (a) Proportion of land protected by irrigation works.
(b) Character of soil.

KAIRA AND PANCH MAHALS.

Nil.

Kaira District.

Mostly sandy from decomposed gneiss, sand stone, quartzite, slate, &c. In parts of Matar and Thasra, there is a little black soil from decomposed trap. The sandy soil is very porous and allows water to soak in quickly. It is, however, very fertile.

Panch Mahals.

The soil is similar; parts of Kálol and Hálol have black soil from decomposed trap, the great Panaghad hill being trap.

(c) To what extent is cultivation dependent on artificial irrigation?

(d) Rainfall.

(e) Is there ordinarily a demand for water in Gujarat during south-west monsoon?

(f) What are the crops which require irrigation?

Paragraph 3.

(a) Do small tanks constructed in black soil hold water?

(b) Can high earthen dams be made of black soil without masonry core walls?

(c) When the land irrigated is black soil, is there any demand for water during seasons of average rainfall or only in case of prolonged drought?

Paragraphs 4 and 5.

4. (a) Any other possible sources of irrigation?

Paragraph 6.

(a) By whom were village works constructed and controlled?

(b) Is any irrigation revenue realized?

(c) Value of such works as concerning village water-supplies for men and cattle without reference to irrigation.

Paragraph 7.

Paragraph 8.

(a) Tracts in which lands or crops are injured by water-logging or excess of water in very wet years.

Paragraph 9.

Paragraph 10.

(a) Districts for which programmes have and have not been prepared.

(b) Examination of programmes, etc.

(c) Arrangements for maintaining or completing programmes.

Kaira District.

In north Matar and part of Mehmabad Taluka, rice crops are assisted by water derived from the Khari river. The works are in charge of the Executive Engineer, Ahmadabad.

Panch Mahals.

Some of the village tanks and that at Malav supply water for rice crops, but there is no systematic irrigation.

The Agricultural Department will give the statistics. It was not supposed to have failed any time before either in Kaira or the Panch Mahals for a century, but in 1899 monsoon, there was only about 7 inches and even grass did not grow. 1900 and 1901 have also been bad monsoons.

Rice fields near tanks take a little water when the late rains are insufficient in both the districts.

Rice crops.

Yes.

No, mixed constructions are also not believed to be sound, and thus where proper material for earthen bunds is not obtainable, masonry dams are the only alternative.

Usually no demand. If large canals are constructed, demand would be created for rabi and sugarcane, etc., particularly in the Kaira District in which the soil is very rich. In the Panch Mahals, the cultivators are Bhils and there will probably be no demand.

The Executive Engineer, Ahmadabad, can give information for Kaira. There is no irrigation work in the Panch Mahals.

For Kaira, the project of making a canal from the Mahi is under the consideration of the Superintending Engineer on special duty and he will give further details. Panch Mahals. If expense is no consideration, sites for large tanks may be found, but they will not pay even working expenses in ordinary years.

They were constructed in former days by the village community. Latterly the District Board has been spending money for improving water-supply tanks. Government in the Public Works Department have spent no money in the Kaira District. One tank, viz., tank at Malav, was repaired at a cost of Rs. 2,865 in the Panch Mahals from Imperial Irrigation. The sum of Rs. 55,179 was also spent on it in 1899-1900 and 1900-1901, as famine work for clearing silt from Famine funds.

The sum of Rs. 888 is realized as irrigation revenue in Kaira District from the Chanvaya Tank and Rs. 1,529 in the Panch Mahals from the tank at Malav.

They are useful for water-supply, etc.

The Collector can answer the question. There is no probability of artesian wells being successful in the Kaira District.

In the Panch Mahals a very careful examination of the geological structure will be necessary as there is a great variety of strata in the different talukhas. None of the out-crops seen by me are, however, of porous materials.

The south-west corner of the Kaira District, that is, parts of Borsad, Anand and Matar, suffered from being water-logged in former years. This was partly remedied by the construction of the Anand-Mogri drain and lately by the Karamsad drain, and two drains in the Matar Taluka, the area of water-logged land is as per two statements attached, but no remissions are known to have been made. No part of the Panch Mahals is water-logged.

The statement of classification and expenditure of famine works for Kaira and Panch Mahals is herewith sent. See note to the statement for their usefulness, etc.

Famine programmes have been prepared both for Kaira and Panch Mahals.

Copies will be shown personally.

There is no special arrangement. The usual district establishment is required to prepare them and maintain them.

It would be better if special establishment in each district be appointed for the purpose.

*Mr. K. G.
Desai.*

2 Dec. 01.

Mr. K. G.
Desai.

Statement showing water-logged area relieved by the construction of the Karamsad drain.

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Táluka.	Name of village.	Area.	Assessment.
Nadiád	Chakalasi	A. g.	R a. p.
"	Kanjari	197 24	1,273 14 0
"	Narsanda	155 17	787 13 0
"	Wadtal	188 21	1,303 8 0
		32 19	247 0 0
		574 1	3,612 3 0

Statement of land subject to floods in Mátar Táluka.

Name of Channel and the villages it would relieve.	Area of land subject to flooding which can raise a Rabi crop only.		Area of land which has been thrown out of cultivation on account of continual submergence.		Total area which suffers from want of outlet to flood waters.	
	Area.	Assessment.	Area.	Assessment.	Area.	Assessment.
<i>1st Tárápur Channel.</i>	A. g.	R a. p.	A. g.	R a. p.	A. g.	R a. p.
Jichaka	528 31	1,179 8 0	32 17	86 0 0	361 8	1,265 8 0
<i>2nd Singiwara Channel.</i>						
Singiwara	59 28	299 10 0	...	...	59 28	299 10 0
Bamangam	124 3	265 0 0	...	...	124 3	265 0 0
	183 31	564 10 0	...	...	183 31	564 10 0
<i>3rd Dettaly Channel.</i>						
Bhalada	111 11	599 12 0	30 22	158 0 0	141 33	757 12 0
Vasia	68 29	426 8 0	4 32	8 0 0	73 21	434 8 0
	180 0	1,026 4 0	35 14	166 0 0	215 14	1,192 4 0
<i>4th Lawul Channel.</i>						
Lawal	92 29	547 15 9	27 18	185 5 2	120 7	733 4 0
Tranja	550 9	2,937 4 0	72 36	432 4 0	623 5	3,369 8 0
Marala	81 26	373 8 0	...	...	81 26	373 8 0
Nagrama	184 27	919 0 0	36 1	88 0 0	220 28	1,007 0 0
Ashalaly	35 38	248 4 0	8 27	61 0 0	44 25	309 4 0
Nandoly	74 37	366 8 0	...	...	74 37	366 8 0
Khandaly	115 36	1,185 0 0	...	...	115 36	708 0 0
Kathoda	233 11	1,185 4 0	...	...	233 14	1,185 4 0
Punaj	169 12	1,026 11 6	24 35	96 5 3	194 7	1,123 0 9
	1,538 28	8,312 7 3	169 37	882 14 5	1,708 25	9,175 5 8
<i>5th Heranj Channel.</i>						
Heranj	388 16	2,241 4 0	60 1	355 0 0	448 17	2,596 4 0
Maliatoj	56 21	362 4 0	...	...	56 21	362 4 0
Machial	73 33	471 2 10	18 18	872 13 10	204 11	1,344 0 8
Garmala	1 23	12 8 0	17 15	129 8 0	18 38	142 0 0
Khadialpura	24 24	208 4 0	...	...	24 24	208 4 0
	544 37	3,295 6 10	207 34	1,357 5 10	752 31	4,652 12 8
<i>6th Undhela Channel.</i>						
Undhela	862 32	591 0 1	64 36	411 13 11	151 19	1,002 14 0
Matar	42 26	292 0 0	...	...	42 26	292 0 0
Iraj	493 24	2,856 0 0	170 3	567 0 0	663 27	3,493 0 0
	622 33	3,719 0 1	234 39	978 13 11	857 32	4,697 14 0
<i>7th Radhawanaj Channel.</i>						
Radhawanaj	29 4	246 0 0	...	...	29 4	246 0 0
	3,428 4	18,343 4 2	680 21	3,451 2 2	4,108 25	21,794 6 4

Note.—As Channels Nos. 4 and 5 are only constructed, the land shown under these Channels will be benefited and no other.

Statement showing expenditure on Works on which relief labour was employed in Kaira and Panch Mahals Districts.

Mr. K. G.
Desai.

2 Dec. 01.

Item No.	Names of Works.	EXPENDITURE.				REMARKS.
		From com- mencement to end of March 1900.	From April 1900 to March 1901.	From April 1901 to September 1901.	Total.	
	PANCH MAHÁLS DISTRICT.	R	R	R	R	
	ROADS.					
	ORIGINAL WORKS.					
	<i>Road Metalling.</i>					
1	Metalling the road from Godhra to Sunth B. P.	28,066	20,070	...	48,136	
2	Metalling the road from Kálol-Hálol road .	4,435	6,304	...	10,739	
	<i>Construction of Roads.</i>					
3	Constructing the road from Dohad to Limdi	64,273	9,159	...	73,432	
4	Constructing the road from Hálol towards Jámbughoda B. P.	30,653	610	...	31,263	
5	Constructing the road from Dohad-Alirájpur road.	30,319	68,679	...	98,998	
	<i>Repairs.</i>					
6	Collecting 10 years' supply of metal at the quarries for repairs to Godhra-Shehra road.	...	10,984	...	10,984	
7	Collecting 10 years' supply of metal at the quarries for repairs to Limkheda-Jhálod road, Local portion.	...	32,688	...	32,688	
	TANKS.					
	<i>Miscellaneous Public Works Improvements.</i>					
8	Improvement to tank at Morwa . .	2,423	58,676	...	61,099	
9	Deepening the tank at Kanelao . .	5,104	26,544	...	31,648	
10	Do. do. Jhálod . .	1,971	1,96,220	...	1,98,191	
11	Do. do. Malao . .	330	54,849	...	55,179	
12	Do. do. Dohad . .	1,296	28,408	...	29,704	
13	Do. do. Ratanpor . .	...	39,806	...	39,806	
14	Constructing a reservoir at Muwalia .	...	1,11,746	35,882	1,47,628	
15	Deepening the tank at Wáda . .	...	21,450	...	21,450	
	<i>Miscellaneous.</i>					
16	Clearing out trees, roots and collecting carved stones, etc., from the Archæological buildings at Chámpáner.	...	2,079	...	2,079	
	<i>Railway Works.</i>					
17	Constructing Godhra-Baroda Chord railway.	30,575	96,640	7,085	1,34,300	
	KAIRA DISTRICT.					
	ROADS.					
	ORIGINAL WORKS.					
	<i>Road Metalling.</i>					
18	Metalling Ladwel branch road of Kapadvanj-Libipura road.	20,026	2,782	...	22,808	

Mr. K. G. Desai. Statement showing expenditure on Works on which relief labour was employed in Kaira and Panch Mahals Districts—continued.

2 Dec. 01.

Item No.	Names of Works.	EXPENDITURE.				REMARKS.
		From com- mencement to end of March 1900.	From April 1900 to March 1901.	From April 1901 to September 1901.	Total.	
	KAIRA DISTRICT—contd.	R	R	R	R	
	ROADS—contd.					
	ORIGINAL WORKS—contd.					
	<i>Construction of Roads.</i>					
19	Constructing the road from Agás to Borsad.	18,236	26,219	...	44,455	
20	Constructing the Mehmabad-Mahudha road.	23,115	305	...	23,420	
21	Constructing the road from Dákoí to Alina	37,306	2,088	...	39,394	
22	Constructing the Mátar-Cambay road	...	136	...	136	
	<i>Repairs.</i>					
23	Collecting 10 years' supply of metal at Páli quarry for repairs to Local Fund roads in Kaira District.	65,025	12,682	...	77,707	
	<i>Railway Works.</i>					
24	Collecting gravel for B., B. & C. I. railway.	...	2,070	...	2,070	
	<i>Irrigation Works.</i>					
25	Clearing and improving drains in Mátar Taluka.	32,478	11,156	...	43,629	
26	Constructing the Karausad Drainage	84,874	1,04,398	8,650	1,47,922	
	TANKS.					
	<i>Miscellaneous Public Improvements</i>					
27	Deepening the tank at Wansor	...	1,33,847	...	1,33,847	
28	Do. Gomti Tank at Dákor	40,809	1,32,082	...	1,72,891	
29	Do. the tank at Devkinansol	43,966	76,235	...	1,20,201	
30	Do. Blobha Tank at Borsad	19,876	3,26,799	...	3,46,675	
31	Do. Eyava Tank	46,182	23,496	...	69,678	
32	Do. Rateval and Gopal tanks at Ladvel.	3,159	74,517	...	77,676	
33	Do. the tank at Mahudha	4,433	73,511	...	79,944	
34	Do. the tank at Borsad	18	53,002	...	53,020	
35	Do. Gangeti Tank at Anklaó	...	45,949	...	95,949	
36	Do. Gam Tank at Alarsa	...	25,943	34,046	59,989	
37	Do. the tank at Traj	...	1,29,945	3,578	1,33,523	
38	Do. Gomti and Bodesar tanks at Sarsa.	...	57,620	...	57,620	
39	Do. the tank at Wantháwali	...	30,344	...	30,344	
40	Do. the tank at Thásra	...	43,903	...	43,903	
41	Do. Wadesari Tank at Narsanda	...	13,542	...	13,542	
42	Do. Napa Tank	...	7,138	...	7,138	
43	Do. Wan Tank at Borsad	...	25,391	...	25,391	
44	Do. Sunjia Tank at Mahudha	...	3,240	...	3,240	
45	Do. Karsalia Tank at Mahudha	...	5,602	...	5,602	
46	Do. Patel Tank at Mahudha	...	8,934	...	8,934	
47	Do. Finao Tank at Mahudha	...	12,575	...	12,575	
48	Do. the tank at Heranj	...	1,675	23,830	25,505	
49	Do. the tank at Amiyad-Divel	...	13	46,859	46,872	
50	Do. the tank at Palaj	...	...	4,392	4,392	
51	Do. the tank at Ras	...	...	11,943	11,943	
52	Do. the tank at Bhetashi	...	...	33,163	33,163	

NOTE—Out of above works, the roads want completing to be of use and the estimates are under preparation. The tanks are complete except the tank at Mewalin and the work is in progress. The last monsoon was very bad one and very few of the tanks have water in them.

1. Q. (*The President*).—You are Executive Engineer of the Panch Mahals?—Yes.

2. Q. Have you been there long?—About three months, I was in this district six years ago for a few years, so that I know the district.

3. Q. Both Kaira and Panch Mahals?—Yes.

4. Q. What do you think would be the best measure that Government could adopt to protect this district against a future famine?—I am afraid it would be a very difficult task to protect this district because at the time when water is wanted most, you do not get it; the rainfall is too deficient; in the Panch Mahals it is even less than in Kaira. As you go higher up in the Panch Mahals the rainfall is still less and the result is that if a tank is constructed it would dry up; the other difficulty is that the soil is too sandy.

5. Q. Is the ground sandy in Kaira and the Panch Mahals?—Yes, in both places; if anything, the soil in the Panch Mahals is more sandy than the soil in Kaira.

6. Q. But there is some irrigation?—Yes. This year no water could be had anywhere. Even as regards the drainage cuts that we made two years ago, people tell me that no water ran through them.

7. Q. Sometimes it happens, does it not, that there are very heavy showers—once it begins to rain—and you get quite enough to fill your tanks?—Yes, but we must store up that water at the head of the rivers or let it run; the head of the river is mostly far off; the Mahi is something like, say, 50 miles above the northern part of the Panch Mahals and unless water is given regularly to the people they would not utilize it; if it is given to them irregularly, they would not be prepared to use it for the purpose of irrigation, because land has to be specially prepared for irrigation and that cannot be done in a short time. The only way to improve the country by means of irrigation is to have tanks that would hold a reasonable quantity of water for two years and then the people would use the water. If such a tank was made, the canals would be very expensive on account of the sandy nature of the soil, they would have to be lined with mud concrete. In America they have been very successful.

8. Q. Possibly they might be made with great advantage by utilizing famine labour?—They might; but it must be definitely settled beforehand on what lines we are going to proceed. Once a project is settled, the question will be where we should begin. In the beginning I am afraid these canals will not pay even their working expenses because the people are not accustomed to irrigation in the Panch Mahals; they are very poor; they have no capital and they are not used to canal irrigation. In the Kaira district the people are better off. I suppose in the course of time, once they get accustomed to the use of canal irrigation, they will take to it, but for a number of years these canals would probably not pay their working expenses.

9. Q. The working expenses will have to be considered after the canal begins to work?—It comes to the same thing. I remember, in old days when irrigation in the Deccan was first started, the canals did not pay even their working expenses, but when people got more accustomed to use the water the canal showed better results.

10. Q. If the canals were used?—Then we would be somewhat better off than we were in 1899. In a year like 1899, unless the tanks were made to hold a two years' supply, we would not be any better off. The rainfall in that year was so slight that there was very little water in the tanks. This year the rainfall was below normal—14 inches—and it enabled people to get their *kharij* crop. It came in small dribbles; it would not have filled the tanks.

11. Q. It is not always so?—No, we get it in that way in bad years.

12. Q. Suppose famine were to come again, what is the best means of protecting your district against it?—We are trying to find sites for tanks in the district, for the construction of new tanks and we are clearing old tanks, that is the best means of protecting the country against future famine.

13. Q. You think the construction of tanks the best thing that can be done?—Yes, for the present. Relief projects should be specially prepared beforehand.

14. Q. Have you had much experience of irrigation matters in famine years?—No, very little. I was for about a year and a half in the irrigation branch; but beyond that the rest of my service has been in the roads branch.

15. Q. Do you keep up a programme of relief works in your office?—Yes, we have one.

16. Q. For how many people have you made provision?—At present we have made provision for only about 30,000 people. This programme was made in May last. After the two years of famine that we had, I suppose, they do not think there is any likelihood of another famine. On looking up my records I see that some works which were proposed at one time were not begun and that some works were commenced but not completed.

17. Q. You have made provision for 30,000?—Yes.

18. Q. How many were employed last year?—On irrigation works the number was about 40,000 to 50,000. I am only speaking from hearsay: I was not in the district then.

19. Q. (*Mr. Higham*).—Under whom are the irrigation works in the Kaira district?—They are managed by the Executive Engineer, Ahmedabad.

20. Q. That is only a small area in the north of the district?—Yes.

21. Q. You have not got a storage tank?—No, we have got a large number of small tanks. They are all under the Revenue authorities. The revenue is collected by them. There was some idea of putting these tanks into repair, but the work has not yet been taken up.

22. Q. The Public Works Department does nothing?—No, there was some correspondence between the Public Works Department and the Revenue Department. I think the original list contained 1,000 tanks both large and small; the Public Works Department could not possibly take them all up. They wanted to know how many of them were big enough to be worth taking up and repaired. I think the list was brought down to 120 tanks; and the Public Works Department was waiting for orders when the famine came and some of these tanks were repaired by famine labour.

23. Q. Were all these 120 tanks repaired during the last famine?—I could not say: we have repaired a good many of them.

24. Q. Have you got a list of those 120 tanks?—Yes.

25. Q. They were irrigation tanks?—Yes, they all irrigate more or less land. We have a definition for large tanks which is as follows—"all tanks giving a revenue of more than Rs. 30."

26. Q. What you call revenue is water-rate?—Revenue on lands affected by these tanks. I am only saying this from what I have heard; it is not on my records. I have heard this definition.

27. Q. All those tanks are old tanks?—Yes.

28. Q. There is no water-rate charged on lands under them?—No.

29. Q. Water-rate is put on new tanks?—It is a sort of water-rate; our rate is collected for every acre actually irrigated.

30. Q. You feed a great number of these tanks from rivers?—Not many; some of them are so fed.

31. Q. Do they ever fail?—They have done very badly this year. I am told that in Sabarmati there was not more than seven feet of water.

32. Q. Has there been no irrigation?—There was what is called Khari cultivation in the northern part of my district where there is an irrigation canal. The canal is made on the Khari river and it feeds some of the tanks. From these tanks the people irrigate. One of the famine works which I have just started this year is the construction of a large reservoir to collect canal water which is wanted by the cultivators.

33. Q. You say that some of the large tracts of the Kaira district are water-logged?—Yes, they are.

34. Q. They have become water-logged within the last two or three years when there was no rainfall?—No, they were water-logged in years of heavy rainfall. In 1900 we made drains which carried off the water and the villagers approved of our plans. In July 1900 we had one or two rather heavy showers and it only filled the channel, which carried off water. It did not rise high enough to fill tanks.

35. Q. Where is it carried off?—Into the Gulf of Cambay.

36. Q. There are no tanks?—There are tanks, but they are mostly at a little higher level; and drainage has to be necessarily at the lowest level.

37. Q. Do you call them irrigation works?—That is the classification in our books.

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83. Q. Were all these tanks in the Kaira district cleared by the Public Works Department or as Civil Works?—They were cleared by the Public Works Department. The work done by the Civil Department is not included in my list.

39. Q. As regards tanks in the eastern district of the Panch Mahals, there are plenty of Public Works Department tanks?—Yes.

40. Q. Where is that, in the lower hills?—Yes; the land is very much cut up, owing to there being many ravines. It is a rocky area consisting mostly of limestone. There is some chance of keeping water if it is found; in the other part a reservoir can be easily constructed and will probably hold water.

41. Q. And on the western side?—We can make tanks, but there is great doubt of their holding water; there is no rock; the ground is sandy.

42. Q. Were you in charge of the Mowalia tank?—No; there is another Relief Engineer in charge of it; it is not complete yet; but I think during this famine, they will probably be able to complete it.

43. Q. You have nothing to do with that?—Nothing.

44. Q. Rs. 2,00,000 was spent to deepen that tank?—It is for the water-supply of the town and for irrigation.

45. Q. Have you seen the Mowalia tank?—No; I have only been in the district three months.

46. Q. Do you know how much they have deepened it?—I have no idea.

47. Q. (Mr. Ibbetson).—Are there considerable forest areas in the Panch Mahals?—Yes.

48. Q. In preparing your programme of famine works did you consult the Forest Department as to what suggestions they have to make?—I did not.

49. Q. I understand you prepared this famine programme?—It is partly prepared by the Collector; the Collector and the Executive Engineer consult together and prepare the programme. The revised programme, I think, was prepared in consultation with the Relief Engineer and the Collector.

50. Q. In your time?—No.

51. Q. Are any forest works contained in the programme?—Not unless the new roads that are being made have to pass through the forests, may be considered forest roads.

52. Q. If there are forest roads would they help the forests?—They would certainly help the forests.

53. Q. They are used for forest purposes only?—No; they are used for forests as well as for general communication. The roads chosen are such as are wanted to connect different places; they would help the forests and the general public too.

54. Q. Is any clearing of the jungles included in the programme?—No.

55. Q. (Mr. Rajaratna Mdlr.).—In your note to the Engineer on special duty you refer to tanks in the Kalol taluka—were they made to benefit the forests?—I am not aware that they were made specially for the benefit of the Forest Department.

56. Q. In answer to Mr. Higham you said something about the repairing of tanks yielding Rs. 30?—It was not the cost of repairs; it was the amount of extra revenue that was derived by regulating the demand for water in these tanks. But for the existence of these tanks these lands would have remained uncultivated; owing to the existence of these tanks a certain number of fields are paying a higher rate of assessment. Government at one time took up the investigation of tanks which were used for irrigation and those which required to be repaired or put into good order were ordered to be repaired by a Government Resolution, and only tanks that gave a revenue of Rs. 30 were taken up by the Public Works Department.

57. Q. They were old tanks?—Yes.

58. Q. In para. 8 you refer to certain water-logged lands. Are these lands left uncultivated in consequence?—Some of them are; some of them are not.

59. Q. Is the out-turn affected? A part of the land went out of cultivation altogether, but some of these water-logged lands were taken up by the people for grass. There

are also lands which in a year of a very heavy rainfall would be water-logged and could not be used for cultivation, but in a year of short rainfall are dry and are used for *rabi* crops.

60. Q. Practically they have not suffered seriously?—No.

61. Q. (Mr. Muir-Mackenzie).—As regards these water-logged lands in Kaira which you showed me the other day, the effect of the drain this year has been to carry off what little water there was in the land. Is there any remedy for that?—Yes, by putting regulators on the drains—putting cross bunds with sluices in them.

62. Q. That would not be a difficult or an expensive operation?—No, not at all.

63. Q. In that way you would make the drains useful in both dry and wet years?—Yes; in 23 years out of 30 they would be very useful.

64. Q. You would advocate, as a suitable famine work in the Kaira district, the digging of new irrigation tanks for rice cultivation?—Certainly, where there are suitable sites and where you have a fair chance of filling the tanks.

65. Q. In other places you would not construct irrigation tanks?—No, there are no good sites for tanks, the leakage will be heavy.

66. Q. I believe projects for two large tanks are under consideration?—I have not seen the sites; and I am not able to judge at present whether they should be taken up or not.

67. Q. Do you think some of these tanks should be fed by a river in a year of no rainfall?—My opinion is that some of them will not fill at all; but I think if reasonable care is taken they should fill.

68. Q. As regards the tanks under rice cultivation for which a special assessment is charged, how are they working?—All the older tanks are generally below the level of the country and most of the cultivation under them now is by lift.

69. Q. In a year of good rainfall?—It is for a short time by flow but mostly by lift.

70. Q. Would not the construction of such tanks as famine works be at least as useful as any other kinds of work?—Yes.

71. Q. And would it not also be a fairly cheap famine work?—Yes, if you could find good sites for tanks which could hold good water and which could be protected by bunds.

72. Q. You would prefer roads?—Yes, if they are wanted. In the last famine three roads were taken up. I should like to see them completed. I am not in favour of starting new roads as further expenditure is required to put them in good order.

73. Q. Sooner than start new roads you would have these inferior tanks?—Yes, I should prefer them.

74. Q. Would they have any effect in substituting an area of rice cultivation for one of dry cultivation?—Probably they would have that effect, but in most cases they would have a rather poor chance.

75. Q. Would that save rice in a year of somewhat inconsistent rainfall?—Yes.

76. Q. How much will a well forty feet deep cost?—About Rs. 50.

77. Q. How much would a cultivator be able to do it for?—He may be able to do it for Rs. 100 less.

78. Q. I suppose his work will not be nearly so good?—Probably not.

79. Q. How long will a well built by the Public Works Department last?—With slight repairs it may last for centuries or it may give way a few months after it is made. It depends upon the man who makes it.

80. Q. It would last a pretty long time?—Yes.

81. Q. Would it irrigate well?—It would not be a failure, but at the same time it would not be very good.

82. Q. It would go in twenty-five years?—There are so many factors to be considered before answering such a question.

83. Q. It would go rather soon?—Yes.

FIFTEENTH DAY.

Ahmadabad, 3rd December 1901.

WITNESS No. 12.—**Mr. P. R. MEHTA**, Deputy Director of Agriculture.*Answers to printed questions.*

1. The answers refer to the Province of Gujarat, where I have served for the last seven years as Survey and Settlement Officer.

3. There is no obstacle to the extension of irrigation arising from the causes mentioned, except in parts where the black cotton soil prevails.

4. Under the Bombay system, enhancement of assessment would not take place on account of works constructed by private capital, nor any exemption is given.

5. For the encouragement of loans under the Land Improvement Act, I would recommend—

(1) Interest at 5 per cent.

(4) Total remission in case of failure of the attempt to obtain water or on obtaining salt water, and remission of unpaid instalments in case the well runs dry or turns brackish after its completion and before the loan is paid up.

(5) Small annual instalments of repayment will be greatly appreciated by the people.

6. No big irrigation work has been projected in Gujarat to produce the effect of depopulating unirrigated tracts, and no such project is under contemplation.

In rice-growing tracts, people evince a strong desire to have the existing tanks improved and new ones dug.

B.

There is no canal of continuous flow in Gujarat. If such a canal were successful in Gujarat, it would add about Rs. 50 per acre per annum to the net earnings of the cultivators.

C.

There are two small canals of intermittent flow—Khari sluices in Kaira and Khari-out in Ahmadabad. They supply water during the monsoon, and are chiefly utilized for rice cultivation. They do not maintain their full supply during the years of scanty rainfall, and in the famine year they failed altogether.

13. Irrigation will increase the value of produce of land under such canals by rendering it possible to cultivate two harvests. In a year of good rainfall, such lands will grow rice followed by *val* or gram, wheat, barely, etc., according to the locality. The second crops are possible, if there is sufficient late rainfall and the canal holds out till October and November. As a rule, however, in Ahmadabad superior variety of rice is grown, which matures late in November, and a second crop is not often possible.

The yield of rice depends upon the position of the rice beds.

Rice beds situated higher up and receiving only the rain water will yield about Rs. 20 to Rs. 25 worth of produce; those situated lower down receiving the accumulated water of the higher levels, will produce a crop worth about Rs. 30 to Rs. 40; and those receiving canal or tank water, in addition, will produce a crop of superior rice or of inferior rice, and a second crop of *val* (*Dolichos lablab*), etc., worth Rs. 50 to Rs. 70.

The produce will be *nil* in the first case, and reduced to less than half in the second and third cases in a year of scanty rainfall: in a year of drought there will be no crop in all cases.

14. It will not be possible to grow rice when the monsoon bursts too late. The rice seedlings will be too far matured to be fit for transplantation. If rice cannot be transplanted, another crop will occupy the rice beds, provided there is ample rain at the end of the season. Too early cessation will reduce the yield to almost nothing.

15. Irrigation from canals, which work only during the monsoon or from small tanks which are also utilized only during the monsoon, is applied only to rice crop. Such a crop is not generally irrigated from wells in addition to canal or well. A very small area in Surat is irrigated from tanks, and later on in the year from wells when sugarcane is cultivated.

16. Please see 13.

19. As irrigation from canals or wells has not been carried out on any extensive scale, no answer can be given from experience as regards any damage resulting from it.

22. Private canals do not exist. Canals are not possible in Gujarat: only two projects have been mooted by the Public Works Department in past years.

D.

23. As in the case of canals so in the case of tanks, irrigation refers only to the rice crop. Tanks in Gujarat are small village tanks, which fill up during the rains, and no water is available for irrigation after the cessation of the rains. The area irrigated is from a fraction of an acre to about 100 acres. Average areas for each district are given in Table V of the memorandum prepared for the Commission by the Director of Land Records and Agriculture.

24. Please see 13.

25. Please see 14.

27. Please see 13.

28. No separate charge is levied for tank assistance: it is included in the land assessment. The assessment is levied on the survey number or the recognized share of the survey number, and is charged, whether it is irrigated or not.

30. No annual charge is incurred on the repairs of tanks. All that is required is to dig them deeper when they silt up. In the black soil districts, such as Surat and Broach, such repairs are needed every 20 years. In Kaira, where the light soil (*goradu*) prevails, the tank silt is utilized for manuring adjacent fields, and no such repairs are needed.

31. Tanks are not constructed by private persons

32. It is not possible for private persons to construct tanks.

E.—Wells.

34. In Surat the average depth to the water is 20 feet in garden lands, and from 30 to 40 feet in other soils; in Broach the depth is 45 to 60 feet; and in Kaira the average depth is 35 feet, but in places it goes down to 45 feet and even more. In Ahmadabad the depth is the same as in Kaira. In the Kalol sub-division of the Panch Mahals and in the villages of Godhra, adjoining Kalol, the soil is *gorat* and the depth to the water is about 30 feet.

In the western portion of Godhra, scanty water is obtained at a depth of 20–25 feet, beyond which solid stone is met with, making it expensive to go further down. In Jhalod the water is deep and scarce. In Dohad the wells are made in low-lying fields, and scanty supply is obtained at a depth of 20 feet, beyond which rock is met with. The areas where wells are liable to fail or become too saline are difficult to particularize, but such information exists in regard to each existing well on survey records. It may, however, be generally stated that sufficient water of good quality is met with throughout Surat, except the Mandvi taluka. In Broach (excepting Ankleshvar, where the conditions similar to Surat prevail), the supply of well water is scanty, as a rule, and sometimes brackish. In Kaira the tract known as *charotar*, comprising the talukas of Anand, Borsad, and Nadiad, the well water-supply is generally plenty, and of good quality. The same conditions apply to the *gorat* tracts of Ahmadabad. The average cost of construction is from Rs. 500 to Rs. 700. Wells last 50, 100 or more years. Water is raised by leather bags.

Wells exist in cultivated fields, and there is enough area to which irrigation could be extended. The average area actually irrigated from a well could not exceed two acres.

35. It is difficult to compare the values of irrigated and non-irrigated crops. The crops irrigated from wells are sugarcane, yams, turmeric, ginger, potatoe, sweet potatoe,

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onions, chillies, and vegetables. But these crops are generally grown on rich lands, and the figures given below are not meant to apply to black soils or to soils of poor descriptions. It may be stated that the cultivation of these crops leave a net profit of about Rs. 50 per acre. Sugarcane is the most important of the irrigated crops. The net profit resulting from it is Rs. 100 and upwards. In addition, it provides work throughout the year to the cultivator and his bullocks. In Gujarat, although sugarcane occupies the field for 12 months, it is really a two years' crop, as, although the canes are planted in December-January, yet, the field has to be manured and got ready during the previous monsoon months.

A dry-crop rotation will yield an annual produce worth Rs. 20 to Rs. 25. In case of better soils and superior tillage, the value will rise to Rs. 40 per acre. Cultivation charges in case of sugarcane amount to Rs. 400. In case of other garden crops, the cultivation charges come to Rs. 100 to Rs. 300 and the produce to Rs. 150 to Rs. 350 and more.

In a year of scanty rainfall, the value of a dry crop will be reduced to Rs. 10 and less, but if irrigated from a well will rise to Rs. 20 and more per acre.

In a year of ample rainfall, the produce will not be much affected.

In a year of drought, the produce will sink to *nil*, and if irrigated from a well, it will rise to Rs. 15 and more. In addition, a fodder crop could be grown which can be valued at Rs. 20 and more per acre.

37. No extra rate is charged for wells under the Bombay system.

38. It may be said that serious difficulties are not encountered in the selection of a spot for wells. In tracts, where it is uncertain, whether the water will be sweet or salt, the preliminary expenditure in ascertaining the same will not exceed Rs. 20, which, if encouragement of well construction is desired, shall be met by Government in case of failure.

No serious difficulties are encountered in the construction of wells.

No assistance has been, up to as late as the last month, offered by Government in the shape of expert advice. The Honourable Mr. Lely has, however, lately arranged to supply Mamlatdars with boring tools. I am respectfully of opinion that expert advice is greatly needed with regard to borings. But it does not exist. No officer is acquainted with the facts and figures in connection with borings. The people have used boring tools. Wells have been bored up to 20 to 30 feet by people with success. But they have not been able to go deeper for want of knowledge on the subject. Wells have been bored successfully in Surat, Kaira, and Ahmadabad. In Broach, where there is a general scarcity of water and the supply in many villages not quite sufficient for even the domestic needs of the people, a well in a spinning mill dug to the depth of 120 feet produced an ample supply for the boilers, and the water level is maintained at about 40 feet. I am respectfully of opinion that an officer should be put on this work, who will study all the existing facts, provide boring tools and a competent mechanic wherever required, and facilitate the work generally. I am confident that people will willingly pay all reasonable costs, if the boring turns out successful. In the beginning at least they should not be charged in case of failure. As all the extra help will be provided by the owners of wells, the costs to Government will not be high.

Character of Soils.—Broadly speaking, there are two varieties of soil prevalent in Gujarat: (a) the black cotton soil, and (b) the *gorat* or light coloured soil. The former may be termed clay loam, and the latter sandy loam. In the Surat district there is another class of soil called garden or *bagayot* soil. It occurs in patches. Here garden cultivation is carried on *par excellence*. Sugarcane, ginger, turmeric, rice, sweet potatoes, chillies, yams, etc., are the ordinary crops grown. Irrigation is by wells, except in case of rice, which is from tanks. In garden soils water is found at not deeper than 20 to 25 feet. Small *pakka* (brick and chunam) wells are constructed, costing from Rs. 150 to Rs. 300. As a rule sufficient wells exist, and no great demand for takavi advances exists in such areas. There are other kinds of soils known by various local names; but they fall, broadly speaking, into one or the other head of the two chief varieties noted above. Generally these varieties are inferior to what are strictly termed black or *gorat* lands. On river banks alluvial or *bhatta* soil exists in patches. These are subject to inundations and are not fit, therefore, to grow a twelve-

month crop such as sugar cane. They grow tobacco, mixture of *jowari*, and other crops. They are never irrigated, because the crops they grow without the aid of irrigation are highly remunerative. Besides the river may be tidal, and irrigation is therefore an impossibility.

As regards their suitability for irrigation, *gorat* soils excel all others (except *bagayot* lands). Irrigation is not practised in black cotton soil. The black soil prevails in the Surat and Broach districts: *gorat* in Kaira and Ahmadabad. In the Pauch Mahals, the Kalol sub-division is *gorat*; other talukas have inferior black soil. The low-lying fields of Dohad Mahal are, however, very fertile.

Crops grown under Irrigation.—In discussing crops grown under irrigation, a sharp line has to be drawn between the rice crop and all others. They must be discussed separately, as the conditions under which they are grown are quite different. First as regards rice crop.

Rice is grown in all parts of Gujarat to a smaller or larger extent. Rice is irrigated from tanks. Tanks are small village tanks, and a few beds of rice from a fraction of an acre to, say, about 100 acres (as many as the capacity of the tank will allow) are cultivated under each tank.

Other irrigated crops, such as sugarcane, yams, ginger vegetables, etc., are irrigated from wells.

Rice crop requires water throughout the monsoon for its successful cultivation. The more the water, the better the crop. Sugarcane requires water during the monsoon, only if there is a long break. The distribution of water is controlled by the villagers themselves, and the water is taken in turns from the tanks. In case of rice, the tank water assistance is assimilated into the land assessment. Both are separately shown in survey records. But for the purposes of collection, only the total assessment appears on the revenue records.

Tanks can be constructed in almost all soils. Black soil holds water better than other soils. No masonry core is needed. * Tanks are utilized for rice cultivation, and tank water is utilized every year. As noted above, larger the supply of water, better the crop. Therefore, there could be no falling off in years of fair or good rainfall. As explained above, the revenue can show no falling off under the Bombay system. Construction of tanks in black cotton soil or soil of any other description in localities where rice is grown will increase the cultivation of rice. Rice crop is a paying crop. Tank assistance can be charged. Therefore, the construction of tanks is profitable both to Government and the people. In Broach and some talukas in other districts, no rice extension can take place. Rice depends for its successful cultivation on manure; manure means additional keeping of cattle; cattle cannot be maintained unless grazing lands exist; and in Broach no such facilities exist, the whole area being under cultivation. Besides rice requires a large surplus population of labourers at the time of transplanting and harvesting, which does not exist in Broach. In the Jambusar taluka of Broach, inferior rice is grown on dry-crop lands, and all over Broach, except near the sea coast, inferior rice is grown between the rows of cotton crop, when the black cotton soil field is kept fallow during the previous year. Such rice cultivation is done on a small scale, and does not affect the general remarks made about the district as regards the policy of extending tank irrigation for rice cultivation.

Wells.—In the Surat district the prevailing soil is black and wells will only be utilized during a severe famine. The depth to the water varies from 30 to 40 feet. In Mandvi taluka from 40 to 60 feet.

In Broach the prevailing soil is black and of a stiffer nature than the Surat black soil. The difference between the two will be apparent, when it is stated that *jowari* (*Sorghum vulgare*) is grown as monsoon crop in Surat and as a *rabi* crop in Broach. In fact, except rice, no crop is grown in the black soil of Broach which matures between October and December. In Broach the depth to the water is 45 to 55 feet. The supply of water is scanty. Wells are built on the bank of the village tank to supply the domestic wants of the villagers.

The part of Gujarat where well extension will be most successful is what is known as *charotar*, comprising the talukas of Anand, Borsad, and Nadiad in the Kaira Collectorate. It is well known for its fertile *gorat* soil, and the skill and intel-

* Tanks silt up slowly. Excavation every 20 years would be desirable in Surat. In Kaira and Ahmadabad the *gorat* soil is benefited by manuring with tank earth. Excavations here are therefore seldom found necessary, as the tank silt is removed by the people to manure adjoining fields.

ligence of its cultivators. It is one of the most densely populated tracts in India, and the land is very much sub-divided. This may offer some difficulty in the extension of well construction. But people are accustomed to pay for the use of wells to neighbours, and means may be devised to build wells under a joint partnership. Joint partnership in wells exists, and when a piece of land possessing a well, held under joint partnership is sold, it passes hands subject to such encumbrance. Here irrigated crops, chiefly fodder crops, were grown extensively during the last famine, both from *pakka* and *kachcha* wells. The depth to the water is 30 to 40 feet, but in parts it exceeds 60. In ordinary years, wells are mostly utilized to water the tobacco crop, which requires about two waterings after the cessation of the rains. Brackish wells containing the valuable salt of potassium nitrate are found and are considered valuable for tobacco irrigation.

In the Ahmadabad district there are *gorat* tracts to which the same conditions apply as those narrated in case of *charotar*. But in many parts of this district well extension is not possible, because the water-supply is scanty and brackish to salt, and owing to the prevalence of black soil.

In the Panch Mahals, the taluka Katol and the adjoining villages of Godhra have *gorat* soil, and well irrigation is practised by the superior class of cultivators—the Pattidars. Abundant supply of water is obtained at a depth of about 30 feet. In eastern parts of Godhra, a scanty supply is obtainable at a depth of 20 to 30 feet, beyond which rock is met with, and the people have not the means of blasting and deepening the wells. The soil also is poor and not suited for irrigation, unless heavily manured. In Dohad and Jhalod the surface of the country is undulating. A scanty supply is obtainable in Jhalod in low-lying fields at a depth of 20 feet, after which hard stone is met with. In Dohad the supply of water is scanty, and, as a rule, very deep. In Halol the soil is either black or stony and shallow. The cultivators are mostly Bhils, and are not likely to take advantage of wells in famine years even where there may be a sufficient supply. On the whole it may, therefore, be stated that the area to which the construction of wells may be profitably extended is limited in Gujarat. At the same time, an active policy of encouraging well construction, wherever irrigation is possible, will result in a great deal of good, and with this object in view I would advocate the opening of a separate department. Such a department could construct wells departmentally where the cultivators

are too ignorant to take up the work themselves, or advance takavi in small instalments and keep a watchful eye to see that the money so advanced is utilized for the purpose of well construction only.

Under the Bombay system, Government will derive no direct advantage in the shape of increase in revenue by helping the people in the construction of wells. In *gorat* soil a well will irrigate from two to four acres. In the famine year two crops were grown in succession in *charotar*. In the black soil, an average of only two acres could be irrigated from a well.

A well with a diameter of 8 to 10 feet and a depth of from 40 feet to 60 feet will cost from Rs. 500 to Rs. 700.

Besides these two means of irrigation, *viz.*, small tanks and wells, it is dangerous to advocate any other system of irrigation in Gujarat. Irrigation canals will, I am afraid, prove the ruin of the province. Gujarat is a flat and level plain, and wherever any serious difficulty has been experienced in the way of successful agriculture, it is in the shape of water-logging. In almost every part of Gujarat, salt efflorescence can be observed in patches in low-lying lands. It is, therefore, to be feared that the introduction of canals will increase the salt efflorescence and do more harm than good by creating *usar* lands as in Northern India.

There have been two canal projects mooted in this part: (i) the Tapti canal, and (ii) the Sabarmati. In the case of the former it has been decided, I believe, that it will not pay. It will pass through a tract of black cotton soil and will not be therefore utilized in ordinary years; it may, however, create water-logging to a serious extent. The Sabarmati canal has been proposed as a paying investment. It may or may not pay. It is, however, probable that the part of Sanand, through which it passes, may be damaged by salt efflorescence. Salt efflorescence is observable in Sanand, and this question requires to be thoroughly threshed out before the project can be advocated as a beneficial measure.

Drainage.—There are parts in all the districts of Gujarat which are low-lying and water-logged. Drainage channels have been constructed in some of them. In some cases drainage channels are not feasible for want of proper fall. As a rule, low-lying lands form salt on the surface. In some cases lands have been relinquished owing to the formation of too much salt.

1. Q. (*The President*)—You are Deputy Director of Agriculture, I understand?—Yes, I have lately been appointed.

2. Q. Is that for the Bombay Presidency?—Yes.

3. Q. Where are your headquarters?—Poona.

4. Q. Were you here during the recent famine?—Yes.

5. Q. You say in your note, "there is no obstacle to the extension of irrigation arising from the causes mentioned, except in parts where the black cotton soil prevails." Would you kindly give us your views about black cotton soil. It covers a great part of India, and apparently from the evidence taken, does not require irrigation. We find there is no question about the cultivators being glad to have the rains of Heaven on black cotton soil, what then makes them reluctant to take irrigation; would they take it if they could get it for nothing?—Except for rice no irrigation is practicable in black cotton soil; this soil is mostly confined to Surat and Broach. The Baroda railway station marks conveniently the division of the two principal varieties of soil—black and *gorat*.

6. Q. You say that rice cultivation on black cotton soil takes irrigation?—Yes, largely, and it is almost more remunerative than rice irrigated on *gorat* soil, because black soil is less pervious to water than *gorat*.

7. Q. We heard in Kathiawar that black cotton soil would take water for anything if there was a substratum of *muram*; what is your opinion?—We have no substratum of *muram*: in the case of *muram*, water passes down the *muram* and along its surface too, thus draining the surface soil.

8. Q. (*Mr. Higham*)—If *muram* is impermeable, does it take water?—It may not take it.

9. Q. (*The President*)—Do you think the agriculturist is right in refusing irrigation except for rice cultivation?—Yes.

10. Q. Take a crop of *juari*, would it be injured if it got water?—In the case of *juari*, where water is required only

once to save the crop, it is impossible to irrigate it from wells; because the black cotton soil cracks and the water passes into the cracks without making any progress over the soil; in the case of a canal it would be easier to irrigate it, because the canal can flood the field, at the same time water is seldom required except in the hot weather. The irrigation of black cotton soil is impracticable and not profitable. Cotton doesn't do well unless the soil cracks, and water would prevent it cracking and make it as the cultivators express it "*thanda*" that is to say, it would not produce a full crop during the succeeding year. In black soil, cotton ripens and the bolls open out as the weather becomes warmer and the soil cracks. In *gorat* soil, cotton grows into a big bush and does not produce much lint.

11. Q. What happens when a storm of rain comes on black cotton soil?—The black cotton soil cracks in the hot weather, and as soon as a slight shower of rain falls, it swells and the cracks are filled up. When the rainfall is small but well distributed, it produces good crops, and when the rainfall is heavy the cotton plants turn yellow and lose their vigour. Unless a spell of sunny weather succeeds, they do not thrive.

12. Q. Would not those conditions hold equally well, if a small amount of irrigation were well distributed?—No; there is no way of allowing a little water over the soil: it goes into the cracks in the black cotton soil.

13. Q. It retains the moisture in itself?—It has great power of absorbing and retaining moisture. If you turn over a block of soil with a crow-bar, you will find it wet even in May.

14. Q. Is there much difference in the black soils of Broach and Surat?—The difference is that the Broach soil is purer and the country flatter than in Surat, where the country is more or less uneven; this allows the rain water to pass off easily. The soil in Surat is mixed with lime. As a result no monsoon crop except rice is grown in the Broach district; cotton is sown in June, but does not ripen till February. In Surat, *juari* is grown as a monsoon crop: in Broach as a *rabi* crop.

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15. Q. So where you find this black cotton soil, you would not recommend any great outlay on irrigation works, unless the people are prepared to sow rice and take to rice cultivation?—Yes, but there is no village which is not prepared to sow rice if you give the water. If you increase the rice area, you directly promote the prosperity of the villages in the rice-growing tract; if you provide irrigation works, you can depend on the people constructing *kharis* or rice-beds.

16. Q. Is rice more profitable than cotton?—Yes.

17. Q. Would what you say apply to Broach?—In Broach, as I have stated in my answers, it will be difficult to extend rice cultivation, because Broach is not a rice-growing district, and the population is sparse. You want 10 to 15 labourers per acre at the time of transplanting and harvesting. I have been told that, if the cultivation is extended, the labour-supply will come; but I do not think so, because the labour will be required during the monsoons, and people of other localities have generally work at that period in their own villages. In Broach, it is the custom for labourers from other parts to come over during the harvesting operations, but that is after January when there is no work in their own villages. Again, rice cultivation requires manure, and to produce manure you want extra cattle, which would mean a grazing area, and that is not available in Broach, because all the land is cultivated.

18. Q. Have you any experience of the Nerbudda and Tapti Valleys? Does the same hold good there?—Yes, the irrigation from the Nerbudda and Tapti will go through black soil, but in my opinion, there will be a great chance of the land becoming *usar*.

19. Q. Won't they irrigate in that country?—Only rice, there must be some dry crops still for proper rotation.

20. Q. (Mr. Ibbetson)—I understood you to say that if we could give them water they would put every acre under rice; what you now say seems to conflict with that statement?—I was referring previously to small tanks only.

21. Q. (The President)—You say, "for the encouragement of loans under the Land Improvement Act, I would recommend interest at 5 per cent." Are these loans largely availed of in Gujarat?—Of late years they have been.

22. Q. What are they taken for?—Mostly for wells.

23. Q. Do they take them for the repair of bunds?—That is supposed to be done by Government.

24. Q. You have mentioned interest at 5 per cent. What is the present interest asked for by Government?—I think it is 5 per cent.

25. Q. Do they find that interest high. Would they avail themselves more of it, if it was lower?—I should say that smallness of the instalments rather than of the interest would be a greater inducement.

26. Q. You think Government recovers too rapidly?—Yes.

27. Q. What period would you recommend?—At present the policy is to grant from 10 to 15 years: 20 years, which is the law, is not given.

28. Q. I understand that the system in Pombay is that, if a man makes a well, it is not placed under wet rates?—Yes.

29. Q. Supposing that, instead of recovering takavi by instalments, Government merely made a man pay wet rates for a certain number of years?—It would come to the same thing.

30. Q. You say in reply to question 13, "the yield of rice depends upon the position of the rice-beds. Rice-beds situated higher up and receiving only the rain water will yield about Rs. 20 to Rs. 25 worth of produce, those situated lower down receiving the accumulated water of the higher levels will produce a crop worth about Rs. 30 to Rs. 40"; that merely means they get more water?—Yes.

31. Q. I suppose rice is the only crop canals would irrigate?—Practically we have got some highly fertile garden lands in which extensive irrigation is practised from wells, and these are well provided with wells.

32. Q. They are exceptional, I suppose?—Yes, they occur in patches; no aid is necessary.

33. Q. Private canals don't exist?—No.

34. Q. Do you mean that they are not possible on account of the configuration of the country?—Yes, I mean that in Surat you would do more harm than good by introducing a large quantity of water, and so increasing water-logging and salt efflorescence.

35. Q. (Mr. Muir-Mackenzie)—You don't mean that they would be impossible?—No, but the harm done by canals would be greater than the advantage derived.

36. Q. (The President)—Have you seen the effect of drainage upon salt efflorescence?—We have got low-lying lands which produce salt efflorescence and some which do not; I think it depends upon the way they dry up.

37. Q. You are probably aware that in certain parts of India salt efflorescence has been checked, and lands washed by effectual drainage?—No.

38. Q. You say in reply to question 30: "No annual charge is incurred on the repairs of tanks; all that is required is to dig them deeper when they silt up. In the black soil districts, such as Surat and Broach, such repairs are needed every 20 years. In Kaira, where the light soil (*goradu*) prevails, the tank silt is utilized for manuring adjacent fields, and no such repair is needed." Are these repairs done by the Public Works Department?—Yes.

39. Q. How is it no annual charge is incurred?—It is periodical, not annual.

40. Q. Have you had much experience of tanks silting up?—I don't think there are any data existing. Tanks want digging periodically. We charge a water-rate to the people who are supplied. There ought to be a more systematic plan of deepening the tanks.

41. Q. Would it be better to take them out of the hands of the Public Works Department, and give them to the people?—The people will not take them up.

42. Q. Why?—Because they pay for tank *himayat* or assistance, and therefore expect Government to repair the tanks. People, even if they did not get sufficient water, would not allow the *himayat* to be cancelled, and thus lose their right over the tank. They would wait in the hope that the tank would be repaired.

43. Q. Even, if Government were to say, we will reduce your wet assessment by a certain percentage if you undertake the maintenance?—They would not agree if Government removed the whole water-cess. The cost of repairs would be very great and beyond their means, because the tanks have not been repaired for many years.

44. Q. Do I understand that you consider Government should do more than it has done in the repairs of minor tanks?—Yes.

45. Q. Have you any figures to support that statement?—In Surat the tank assessment comes to Rs. 60,000, and I think the charge incurred is Rs. 10,000 a year, that is repair charges.

46. Q. So that Government make a clear gain of Rs. 50,000?—Yes, if you wish to put it that way.

47. Q. (Mr. Muir-Mackenzie)—You consider Rs. 10,000 much too little of course to spend?—Yes.

48. Q. That is because the tanks have been left so long without being repaired?—Yes.

49. Q. They were left a long time without any repairs at all?—Yes.

50. Q. If the repairs had been done regularly and annually, do you think the cost to Government would have exceeded Rs. 10,000?—Possibly not.

51. Q. Would it exceed Rs. 20,000?—No.

52. Q. That is to say, if the tanks are annually repaired Government can make a very reasonable profit upon its water-rate?—Yes.

53. Q. Perhaps Government would have to spend some Rs. 3,00,000 in order to put them into repair?—Yes.

54. Q. That is, because they have been left so long out of repair?—Yes.

55. Q. (The President)—As regards the construction of wells, have the recent famines created any stimulus. Are more wells made now than before?—They made some wells during the famine, but the people cannot be expected to do anything for the next ten years.

56. Q. Does not even the fear of a future famine induce them to make them?—They are afraid to incur fresh liabilities. There is no money left in the country after the late bad years topped by a severe famine.

57. Q. Some witnesses have recommended that Government should itself make the wells, do you approve of that?—From the cultivator's point of view, it would be a good thing.

58. Q. Is it your experience that there is much difficulty about determining the proper site for a well?—None at all; as a matter of fact, we have very little difficulty, because we

have no hard rocks. It is possible to dig to water level, 40 feet, at a cost of Rs. 10 to Rs. 15. The cost being so little, that elaborate investigations and the use of apparatus are not necessary.

59. Q. How do they sink wells?—They first make a hole, and when they reach good water, they put in a wooden frame and go on building and sinking.

60. Q. You say in reply to question 54 "wells exist in cultivated fields, and there is enough area to which irrigation could be extended. The average area actually irrigated from a well, could not exceed two acres." That is a small area?—Perhaps, but that is my experience though statistics bring out three acres; there are many wells that do not irrigate at all.

61. Q. But if the wells are in the hands of a good cultivator, how much could he irrigate from a well?—He would irrigate in *gorat* soil four to five acres, and perhaps not more than two acres in black soil. That would be a well of one or two *mots*.

62. Q. I understood you to say that, owing to the depth of rock, there was no difficulty in fixing the site of a well; but you say, in reply, to question No. 38—"I am of opinion that expert advice is greatly needed with regard to borings."—That refers to the period after they have made a well. Boring apparatus to deepen wells after they have been already built 30 to 40 feet, and experts to work them are greatly needed. The people themselves use such apparatus and have succeeded in improving many wells. A well costing Rs. 1,000 which, but for the boring, would prove useless for want of sufficient water, would become efficient by the expenditure of an extra Rs. 20 to Rs. 50 spent on boring 20 to 30 feet, but the people do not properly understand boring, and their present efforts are haphazard. It is, therefore, necessary to have an officer who has studied the subject.

63. Q. You say, "on river banks alluvial or *bhatta* soil exists in patches;" these are subject to inundation? These lands are not protected?—No, *bhatta* is that soil on which alluvium is deposited every year in high floods.

64. Q. It is a positive benefit to have the river flood on it?—Yes.

65. Q. I understand you are not an advocate of large tanks. Do you mean by a large tank one irrigating 5,000 acres?—Yes.

66. Q. Yes. Would you object to storing water on a large scale like that. If you had a site, do you think it would be a valuable protection for the province against bad times?—My objection to irrigation on a large scale is that there is fear of creating water-logging and of throwing land out of cultivation by salt efflorescence.

67. Q. Are the people nervous about this water-logging?—No, it has always been recognized as likely to occur.

68. Q. I suppose in these dry years they are rather in favour of it?—Very much so.

69. Q. (Mr. Muir-Mackenzie)—Would *kiaris* or rice-beds succeed in water-logged places?—You would make water-logged areas smiling plains by the extension of rice cultivation, because rice being a semi-aquatic plant succeeds in such areas.

70. Q. You must be very careful lest you spoil the prospects of these lands in years of short rainfall?—Yes.

71. Q. (The President)—I suppose you are an advocate of drainage on lands that are water-logged?—Yes, drainage from the very nature of the case would improve such lands; but it has lately come to our notice that in the case of an old drain in the Wagra taluka of the Broach District and the Jantran drain of the Jambusar taluka of Broach the people are complaining that the "tilth" or surface agricultural soil is becoming impoverished. In Jantran the people actually requested that the drain might not be repaired and improved, while this was being done as a famine-relief work. The force of the water is said to wash away the surface soil, exposing inferior subsoil.

72. Q. You have seen these famines, and are quite cognizant of the terrible loss to the country that has occurred; supposing you had reason to believe that there was going to be a famine in three years' time, what measures would you take to prepare the district to meet it?—The irrigation resources of Gujarat have not been systematically investigated. I would advocate that sites should be found for tanks and wells, and boring apparatus provided. The borings should go on simultaneously.

73. Q. Do you think there is scope for the extension of tanks?—There are already perhaps 4,000 tanks in Gujarat

for irrigation and drinking purposes, and it is probable there are many more; these are all very old works, but we have done nothing to investigate further sites. By adding to the number of tanks, you would increase the rice cultivation of the talukas, and the prosperity of the province.

74. Q. The measures you would take would be to make the province richer, and so better able to stand the trial when it came; but small tanks would probably be empty at such a time?—Yes, no doubt. I advocate wells also.

75. Q. You would not have an irrigation canal?—With the exception of wells, probably no irrigation work would supply water during an actual famine year. The Sabarmati canal would perhaps do a lot of good if it did not dry up.

76. Q. (Mr. Higham)—With reference to what you say about the digging of tanks, if any new ones were dug would the people be willing to pay a water-rate?—Yes.

77. Q. Would it be possible for land-owners to make new tanks themselves: if they made them there would be no water-rate to pay?—They have got no money.

78. Q. Suppose liberal advances were given?—Individual holdings are too small to make the owners join in a big venture like that.

79. Q. I suppose water-rates are only paid when they take water?—They have to be paid every year.

80. Q. Suppose they do not take water?—They have to pay the rate all the same. If the people could get water till October, they would be willing to pay the rate.

81. Q. What do you do in practice?—For the existing tanks we charge a consolidated rate.

82. Q. What about new tanks?—There are none.

83. Q. What is the difference between dry and wet rates per acre?—In Surat the whole rice assessment varies from 6 to 25 per acre, according to the capability of the soil and rice-beds.

84. Q. Supposing you make new tanks, and bring land under rice cultivation that is at present under dry rate, what would be the increase in the rates?—That will depend upon the quantity of water that you give and the month up to which you can give it; the enhancement will be from Rs. 2 to 5 per acre.

85. Q. If you charge a water-rate only when water is taken, it would be much more?—It may be Rs. 7 per acre; the people would pay it willingly.

86. Q. The water-rate is not more than double?—No.

87. Q. Then, if a man takes water once in two years, it would not matter which way it went?—No.

88. Q. They would take water every year?—Yes; very nearly.

89. Q. (Mr. Ebbeson)—However ample the rainfall?—Yes.

90. Q. (Mr. Higham)—You say no annual charge is required for repairs, but only periodical?—Yes.

91. Q. Do not the bunds require repairing?—No.

92. Q. Have not the tanks got bunds?—Yes, they supply water by flow. But the bunds don't get broken and silt is put on them when the tank is cleared.

93. Q. (Mr. Muir Mackenzie)—Would not the cost of clearing the tanks be much greater than it would be, if they had not been neglected for so many years?—Yes, if there was a large amount of silt to be cleared, the cost would be very great; if it was cleared periodically, the cost would be only a few hundreds.

94. Q. (Mr. Higham)—Were not the tanks cleared during the last two famines?—The village tanks have not been touched during the last famine. They ought to be cleared, famine or no famine.

95. Q. What would be the expenditure on them?—I don't know. Since a wet assessment is paid they ought to be cleared.

96. Q. Is any record maintained of the money spent periodically on each tank?—It could be got from the Executive Engineer.

97. Q. Is there any expenditure incurred by the District Authorities?—Yes, on tanks for drinking purposes.

98. Q. Small tanks are not cleared at all by the P. W. D.?—No, that is, after the late Resolution.

99. Q. Has any reduction been made in the assessment on them?—No, the Revision Survey was made, and the rice lands were re-assessed according to the capacity of the tank.

100. Q. When?—During the last decade.

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101. Q. Allowances would be made for the fact that a tank had silted up?—Yes, and for *kiares* which did not receive tank water.

102. Q. What measures would you propose for clearing the small tanks; would you put them in the hands of the Public Works Department?—There is no other agency to do it, the villagers would do it, but they have not the money.

103. Q. If the villagers got the money, would they do it?—It would require supervision.

104. Q. Could not the village headmen do it?—If a small number of men were employed, they could, but not a large number.

105. Q. You would only require the Public Works Department to measure the small tanks, and then it could be given to the men to clear?—Yes, that could be done.

106. Q. You have no Civil Agency to look after the work?—The Civil Officers might manage the small tanks through the villagers, but the Public Works Department or the District Board Overseer would have to check the work.

107. Q. Money would be advanced by Government, and the District Board would not come into it?—No, as assessment is charged on the tank, Government should pay for the repairs.

108. Q. The transactions would be dealt with by the Civil Authorities and not by the District Board?—Yes, the District Board would have nothing to do with it.

109. Q. Have you any idea what expenditure would be required to put the small tanks in Gujarat into order?—No.

110. Q. How many tanks are there which are not under the Public Works Department?—I cannot say, probably under a thousand.

111. Q. You say the people have no money; would it be a good thing to spend money on these tanks now for the sake of clearing them, and also to put a little money into the pockets of the villagers?—I think the tanks should be cleared, because they secure the rice crop, and the work would give employment in these hard times.

112. Q. In regard to tanks under the Public Works Department, are they kept in a proper state of repair?—There are no tanks in charge of the Public Works Department. When repairs have to be done, the Collector asks the Public Works Department to make an estimate of the cost.

113. Q. The initiative is taken by the Civil Officers?—Yes; the Public Works Department have nothing to do with the tanks except to repair them.

114. Q. Are they ready to repair all the tanks if asked to?—I think they can't get funds; the budget grant is limited, so the work is not done.

115. Q. The repairs of certain tanks may have to stand over?—Yes.

116. Q. In regard to wells, what is the lift up to which people will work?—Our Survey Department recognizes 40 feet as the ultimate depth to work profitably.

117. Q. It would be no use to offer any encouragement for the construction of wells to lift more than that?—No.

118. Q. Supposing Government contributed the whole cost of making a well when you are more than 40 feet below the surface, would the people not work it after it was made?—It would not be profitable; and that sort of place is rare in Gujarat.

119. Q. Supposing you have wells at from 35 to 40 feet and the spring level fell in a year of drought to such an extent that they could not work it?—In one year of drought, the spring level would not fall much; in case of continued drought the spring level would fall from five to ten feet, but then they would work up to 50 feet if it were just to save a crop. But in a famine year, in addition to the water level being low, the cattle would be too weak to work and the area irrigated would be small. In Kaira and other places, in the *gorat* tract, where the water is not deep there was a large area of fodder under irrigation. This year the wells are low and the water scanty.

120. Q. I suppose the level of the wells does not fall very much in a first year of famine?—No, it was not much affected in 1899.

121. Q. Can you give any idea of how much it was affected?—I don't think it was affected beyond five feet?

122. Q. And in the next year, I suppose it was lower?—Yes.

123. Q. And now?—Now the water is much lower; it has been getting lower and lower every year owing to the continuous drought.

124. Q. Some people talk about black soil and some about black cotton soil; is there any difference between the two?—No, practically none.

125. Q. You have a certain amount of black soil in Kaira and the Panch Mahals?—Yes.

126. Q. The people don't grow cotton but wheat on it?—The black soil lies low, so they grow wheat and not cotton on it. It is too moist for cotton. In Ahmadabad they grow cotton.

127. Q. If they had plenty of water, they would grow rice instead, I suppose?—Yes.

128. Q. With regard to what you say about its being impossible to irrigate black soil under wells, because the water would run down the crevices in the dry weather; I could not irrigate when there is a failure of the late rainfall. Would not the crevices fill up directly the rain falls?—Yes; but people are afraid of irrigating any crop except rice during a drought in the monsoon in black soil, as if rains come down on the top of irrigation the crop would be very much injured by excess of moisture. That is the reason why people wait as long as they can before they apply to the Canal Authorities for irrigation water.

129. Q. Would you advocate putting wells down in black cotton soil?—If you want to spend money for the purpose of saving life it would do, but not for agricultural purposes. The well would not be used perhaps for 10 or 15 years.

130. Q. It will never pay?—No, it will not pay.

131. Q. You say the distribution of water from the village tanks is controlled by the villagers themselves. I suppose there is some record about the lands entitled to water?—Yes. There are sometimes disputes but not often except when there is scanty rainfall.

132. Q. If there is more water in the tank than they want, do they ever give it to land outside?—Yes, and a water-rate is charged.

133. Q. Who gets that?—Government.

134. Q. It rests with the proprietor to take it?—If no one requires the water, application is made to the village accountant for it.

135. Q. He squares the village accountant?—He cannot take it before the other people who have a right to the water have had their share.

136. Q. Would the man have to put in a written application?—Yes.

137. Q. Do the settlement records show for each village tank what is the area normally irrigated?—The village accountant has got a statement that shows it.

138. Q. What does it show?—Practically the whole of the area which bears the tank *himayat* is irrigated every year. It shows the area on which the water assessment is put.

139. Q. Do you think that the rice area has diminished?—No.

140. Q. (Mr. Muir-Mackenzie)—Has the yield diminished?—Yes, owing to scanty rainfall.

141. Q. Have you any reason to suppose that the water received now is less than was estimated after the Revision Settlement was made?—Sufficient time has not passed to show if there is a difference on account of tanks silting up.

142. Q. (Mr. Higham)—You said that land-owners are willing to have tanks and get irrigation. You also said that the people won't make tanks or undertake the repairs even if let off the wet assessment. Does this mean that the cost of construction and maintaining tanks is more than the profits derived?—There must be a lot of places in Gujarat in which it would pay, supposing you could find the spots.

143. Q. Take it as a whole, if Government lays out money would it pay?—It would not pay except in certain places.

144. Q. I understand the Tapti Canal is considered undesirable, because it will irrigate the Broach district and irrigation is not required there?—Yes.

145. Q. What are the land-owners in Broach saying about it. Do they desire it?—I have not talked to anybody about it. In fact the project is an old one and no discussion on it has taken place in recent years.

146. Q. There have been applications from people for a canal from the Sabarmati, but nothing of the kind from

Broach?—There are water-logged villages in Broach and the canal will do harm and increase the water-logging.

147. Q. (Mr. Muir-Mackenzie)—You have been to England to the Royal Agricultural College and taken an agricultural diploma?—Yes.

148. Q. You have also had one of the Government Experimental Farms in the Deccan under your charge?—Yes.

[Mr. Muir-Mackenzie to President.—He is regarded as an efficient officer and a very good authority on such matters as soils, survey, and technical matters now under discussion.]

149. Q. I am anxious to get an explanation regarding this question of rice assessment. You were asked the difference between the dry crop rate and the wet rate. Now, taking Borsad, I find the dry crop rate at the last Revision Settlement brought an average of Rs. 5-4-11 per acre; the rate upon rice lands which existed from the original settlement brought out a rate of Rs. 7-8-9 per acre, the difference of Rs. 2-4-0 is the difference which you want. How much of this Rs. 2-4-0 would Government get, if they made a new tank?—This Rs. 7-8-9 represents the average assessment of rice; but the *kiaris*, bearing tank *himayat*, would be assessed higher, say about Rs. 12.

150. Q. The tank *kiari* rate would be Rs. 12 per acre and dry crop is Rs. 5-4-0. How much would be for *akasia* or rain water and how much for tank *himayat*?—It will be about Rs. 3½ each.

151. Q. In rice lands, Government would charge both *akasia* and *himayat*?—No. Government would charge only dry crop rates *plus himayat*.

152. Q. If a man converts his dry crop land into rice lands by bunds, so as to hold rainfall, Government charges nothing; but, if a tank is constructed which gives him water, Government will charge for the water?—Yes. In the revision Survey *Position class* was charged instead of *akasia* in case of new rice, but as the field work is finally closed now, in cases of new rice on dry crop lands, no increased assessment could be charged except for the use of the tank water.

153. Q. And the amount of that charge for the water will consist of the difference between what the rice land would have been assessed at, if it had been old rice land without *himayat*, and the full charge with *himayat*?—It ought to be.

154. Q. Taking this district again, we arrive at an average of Rs. 12 for tank-assisted rice?—Yes.

155. Q. And about Rs. 8 for unassisted rice: therefore, Government would charge Rs. 4 an acre for tank assistance. On the other hand, we have had no case in which such a thing has been done; no new tank has been made?—No.

156. Q. Now, as regards this question of tank repair, the rates at the revised settlement, which took place within the last decade, were fixed with reference to the state of repair of the tanks at that time?—Yes.

157. Q. Have you any reason to believe that the tanks have got into a very much worse state of repair since that date?—No.

158. Q. If Government now puts them into a thorough state of repair, it will be giving the people the benefit of the tanks with better supplies than at the time the assessment was made?—Government is under an obligation to repair them: they have not spent money on the construction of the existing tanks: they charge water-rates, and ought to repair them in order to keep up the supply.

159. Q. I understand you to say that the supply has not materially diminished since the time of the Revision Settlement?—No. If you had tanks you would add greatly to the prosperity of the villages. The Revised Settlement Survey was made during the last ten years, and all the tanks have been assessed. There have been no changes since then, and no material improvements. My reference is to the obligations of Government from the beginning—before the original settlement.

160. Q. (Mr. Ibbetson)—Supposing that at the last Revision Settlement, a tank was badly silted up and a low rate was put on the land in consequence; and if Government now clears out the tank and improves the supply of water, is there any way by which it can enhance the assessment during the currency of the settlement?—No.

161. Q. (Mr. Muir-Mackenzie)—Is there no power that Government reserves under the Land Revenue Act?—I believe Government have no right to enhance the assess-

ment on *kiaris* bearing *himayat* however much they improve the tank during the currency of the existing settlement. They could not do so at the termination of the existing settlement, because individual inquiry and enhancement will not take place. In future assessments, there will be only a general rise or fall of assessment, according to prices, &c.

162. Q. You talk of the obligations of Government. For the sake of argument, I do not say it is my opinion, I wish to contend that Government is under no obligation, legal or moral, to repair these tanks. On what grounds do you consider that Government is under obligation to repair them?—We charge higher rates for tanks, because people are supposed to enjoy a continued advantage; but they cannot continue to enjoy that advantage, unless the tanks are repaired. We charge a higher assessment; but we do not spend any money on the tanks. As we charge a higher rate to the people for tanks, I think we are morally bound to see that a full supply of water is made available.

163. Q. If a higher rate is charged on tanks, Government is bound to make the full supply available for which the rate is charged, but we agreed just now that at the last Revision Settlement, the amount of supply that was available was estimated, and the rate charged was based upon that estimate?—If you take that stand-point, then you get out of the obligation.

164. Q. I want to come to a logical conclusion. Where has Government failed in doing what you consider part of its duty?—I say that Government has charged assessment for thirty years, and yet has never repaired the tanks.

165. Q. Are you quite sure that the tanks were not just as much silted up at the beginning of thirty years as they are now?—No; but it is reasonable to believe so.

166. Q. (Mr. Ibbetson)—Take the case where a tank was partly silted up, and suppose that the supply was very insufficient and insecure, that, in consequence, at the revision of settlement, a low rate was put on the land; and suppose, then, that Government spends a considerable sum in clearing the tank; would you then revise the assessment and charge a higher rate, or would you still prevent Government from charging the higher rates?—I think we would have to be content with a low rate, unless the whole village is charged, and you put the village into a new group during the next revision; but a water-rate or increased assessment could be charged if the people agreed to pay it in consideration of the advantage they would derive from the repairs or extension of tanks.

167. Q. You would put on the water-rate, although you are already charging wet assessment?—We could put on the water-rate per acre and then deduct the amount for wet assessment from the consolidated rate.

168. Q. You say that, if you make tanks, people will grow rice; then the construction of tanks is one of the best possible means of helping the people if they can have practically unlimited rice cultivation?—Yes.

169. Q. A good many people seem to think that rice cultivation is insecure?—I do not agree with that view; rice cultivation is less insecure than any other cultivation if protected by tanks.

170. Q. (The President)—About the Tapti and Ner. budda projects you say, "they will never pay, because people must keep a certain area of dry crops"?—Yes.

171. Q. Is that only because it is black soil?—Yes.

172. Q. Why need they keep the area for dry crops. Why should not they irrigate almost the whole of the area?—Dry crops must come in rotation as the land is black.

173. Q. Why not irrigate fodder?—My great objection to a canal in these two talukas is particularly that it will waste certain valuable areas which now grow excellent dry crops. Fodder crops do not pay except near big cities.

174. Q. That is a very important point. Whereas up-country we irrigate with plenty of water nearly 75 per cent. of the area: here you seem not to care for water except for rice crop?—Yes.

175. Q. Supposing there was plenty of water available apart from the black soil, why should not every field be irrigated?—The people do not want it.

176. Q. Why do they not want it?—In Gujarat they could grow valuable crops of *juari* and *bajri* without irrigation. In the monsoon the people would hold off and wait for rain in the fear that if rain fell after irrigation the crop would be more damaged than before.

177. Q. What about the wheat crop?—Wheat may be increased by irrigation.

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178. Q. Wheat is sown on rice lands, I suppose?—No, very little; most of the wheat is grown on low-lying land on which moonsoon crops cannot be grown. They do not irrigate wheat, except here and there in patches.

179. Q. Why not irrigate a large area of wheat. They do it up-country under canals?—It could be done, but that is not the practice of the country because other crops equally valuable are more easily grown without irrigation. Almost all wheat even grown in Gujarat is unirrigated.

180. Q. It is grown in wet soil?—Yes.

181. Q. (Mr. Ibbetson)—I thought that you said you had some irrigated wheat in the district?—Yes, in particular areas.

182. Q. (The President)—That is only in black soil?—Yes, only on low lands.

183. Q. Would not higher lands like those of Kaira grow wheat?—They would.

184. Q. Would it pay?—Yes, if irrigated under a canal.

185. Q. (Mr. Ibbetson)—The question I want to clear up is this; if Government make tanks and canals would the water be used?—Yes.

186. Q. Do you think a canal would pay?—I suppose a canal would pay in the light soil of Kaira, at least the water would be utilized fully.

187. Q. You propose that takavi loans be returned in more than ten or fifteen instalments; how many do you propose?—Thirty to fifty, leaving it at the option of the people to pay it sooner if they like.

188. Q. How long does a well last?—I think they go on everlastingly if repaired.

189. Q. Do they ever turn brackish?—Some of them do, on the sea coast especially.

190. Q. In that case you would remit the balance of the loan?—I would: it would encourage the people.

191. Q. Supposing a well costs Rs. 500, and you have Rs. 50 paid up in instalments after ten years, and then the well fails, and Government has to remit Rs. 450. Government would lose most of its money: the term seems too long?—If you want to promote well irrigation, I think the loss will have to be suffered.

192. Q. Do you think it is worth while?—Yes.

193. Q. A great number of small tanks are silted up; they are so small that they are hardly worth the attention of the Public Works Department; and the Government does not propose to clear them, because they are so small?—Yes.

194. Q. Would it be advisable for the District Boards to take them in hand, supposing there is no legal objection?—You may give them legal power to take enhanced assessment for clearing the tanks. Why should not Government do it?

195. Q. Because they are too small to repay the cost of professional labour?—I think that would be better done by the village authorities; the Collectors and Assistant Collectors could manage that.

196. Q. You prefer that Government should do it directly through the Collectors and Assistant Collectors, rather than by the agency of the District Boards?—Yes.

197. Q. Why should not the District Boards do it?—Practically a District Board is a Collector.

198. Q. You say that it would be a good thing if Government were to make wells themselves, and then leave them to the cultivators?—Yes.

199. Q. You don't propose that wells in the land of an occupant should be made without the consent of the occupant?—No.

200. Q. Do you think the occupant would willingly allow Government to make a well in his land?—I think he would be very much pleased to allow it.

201. Q. Do you think a cultivator would not object to a lot of small Government officials coming on to his land and coming there continuously for some time?—No.

202. Q. Do you think Government can dig a well as cheaply as cultivators can?—Perhaps not.

203. Q. If Government dug a well and charged a water-rate, would it be objected to?—They would pay for the water in a year in which they used it, but they would never consent to a permanent increased assessment.

204. Q. Well, if they object to the water-rate, then Government must recover their money by instalments?—

You may do so, but they would rather have that than a permanent increase in assessment.

205. Q. Suppose the villagers could build a well for Rs. 500, and suppose the Public Works Department builds it for Rs. 1,000. Government has to recover the Rs. 1,000 from the villagers, who will thus have to pay twice as much as if they had built the well themselves for Rs. 500?—Yes.

206. Q. Would the cultivator pay at the rate fixed on for Rs. 1,000, when he can make a well himself for Rs. 500?—Yes, in a year in which he could utilize the well.

207. Q. In how many years would he utilize the well?—two in three or one in three?—In some places he could utilize it for three out of five years; in other tracts hardly ever.

208. Q. The cultivator would not, you think, approve of the scheme of Government making the well?—Not, if you want him to pay for it.

209. Q. In fact, your view is that, if Government were to make wells regardless of expense and without recovering the cost, that it would be good for the cultivator?—Yes.

210. Q. In black cotton soil, it would not pay the cultivator to make a well?—No.

211. Q. Even, if a number of wells were made in black cotton soil, you believe they would practically be unused?—Yes.

212. Q. You are very much afraid of water-logging from canals in black soil?—Yes.

213. Q. And even from large tanks?—Yes.

214. Q. Have you ever known of water-logging in low-lying tracts?—Yes.

215. Q. Have you ever seen land water-logged by canal irrigation?—No, not in these parts. We have no canals except two small ones.

216. Q. You say that the people do not take advances for tanks, because they think that the Government is bound to clear them. Would they take advances to make new tanks?—No, the area commanded by each cultivator is very small; I do not think that a hundred or two hundred cultivators could be induced to join together to make a tank.

217. Q. No co-operation is possible?—No.

218. Q. You say that Government should make small tanks where there are suitable sites; do you think there would be many suitable sites: is any large extension of irrigation possible in this way?—Yes, Government can make tanks which will irrigate from five to fifty acres.

219. Q. Would they pay Government a reasonable return?—Yes.

220. Q. Do you think a very considerable extension is possible?—Yes.

221. Q. Has any survey been made?—No.

222. Q. No one knows where these sites are?—No.

223. Q. Could not a survey be started?—Yes, for the purpose of a thorough investigation of sites; they should also take up the question of boring.

224. Q. Have you ever known of manured soil being irrigated?—No.

225. Q. Can you tell us what the result to the soil would be?—Without manure irrigation would not pay.

226. Q. We are told constantly that the great obstacle to successful irrigation is the want of a manure supply?—I do not see why the supply should be limited.

227. Q. If you had an unlimited supply of manure, it might pay?—I think manure will come when it is wanted. The area under irrigation would increase gradually and sources of manure supply will increase in proportion.

228. Q. You cannot say what is the effect on the soil of irrigation without manure?—It would produce low class cereals and the soil would be impoverished.

229. Q. Do you speak from experience?—Yes, I have never heard anywhere that irrigation had injured the soil.

230. Q.—Have you ever heard of irrigation without manure?—In the Konkan rice is never, or very seldom, manured; but the rain water must bring down silt from higher levels. Even in the Konkan fields receiving manure grow better crops than those that are neglected.

231. Q. You do not speak from experience?—No, I have never heard that irrigated crops are grown anywhere without the assistance of manure.

232. Q. You think that there is great room for the extension of wells?—You may do a lot of good by extending wells in places like Charotar. It is a very fertile tract and has an industrious class of cultivators. If Government spend money there, it will be a profitable investment. A lot of good could be done there.

233. Q. (Mr. Rajaratna Mdlr.)—You say that, at the Revision Settlement, the areas fallen out of irrigation owing to silting of tanks were small?—They were insignificant.

234. Q. You also say that in fixing a low assessment at the Revision Government took into consideration the condition in which the tanks were when they were taken over by Government. How much lower was the assessment?—I do not think it was very much lower. The increase of assessment depends on the capacity of the tank and other factors such as prices, &c., and not on the classification of land. Our classification is one thing and our assessment another.

235. Q. Can you give me an approximate idea of the loss of revenue to Government in consequence of the bad state of the tanks?—No. I doubt if it could be worked out. We never think of assessing water separately and land separately. Our estimated proportion of water-rate and soil-rate is not a true ratio.

236. Q. The poorer the soil, the better the advantage to the cultivator by means of irrigation from tanks?—Not in this part of the country.

237. Q. I simply want to know what revenue is sacrificed on account of the unsatisfactory condition of your tanks?—If the tanks had been kept in proper repair, the assessment would have been raised. For instance, in the Surat district, where the tank assessment is Rs. 60,000, if the tanks had been kept in proper repair, I think the assessment should perhaps have gone up at the revision settlement to Rs. 70,000; this, however, is simply a guess.

238. Q. You say, "no remission is given on lands left uncultivated, owing to insufficiency of water supply." Is that the practice?—It has been the practice in these parts.

239. Q. Are there rules for granting remission, when the supply fails?—No; it is not the custom.

240. Q. The rules don't prohibit it?—There is no rule prohibiting it. I do not know of any rule which says remission should be given.

241. Q. Was no remission granted in the recent famine, even when the tanks gave out?—It was granted for the whole crop, and not for water-rate only.

242. Q. You say irrigated cotton does not pay as well as other agricultural crops, have you made any experiments?—Not exactly; I think we did something of the sort; we experimented with cotton in the Khandesh district. In the *gorat* soil cotton grows in huge bushes without producing much lint because this soil does not crack and dry up quickly as the black cotton soil.

243. Q. In your written answers you refer to the average area under irrigation. Is that area cropped a second or third time, or is only one crop taken?—One crop. What I mean is an average area irrigated in ordinary years.

244. Q. Is a second crop not taken from the same field?—It may be, if the field is very strongly manured.

245. Q. Yesterday, we had some evidence regarding paddy lands. How do you class them in your settlement; at what rates do you assess them?—Rice lands are assessed according to the capacity of the beds to hold rain water, whether irrigable from a tank or not, and the fertility of the soil.

246. Q. On what grounds is such a charge made if lands are turned into rice lands at the rayats cost? If new lands are turned into paddy lands, such lands are charged as new rice on which the assessment is lower than that on the old rice.

247. Q. Supposing the rayat gives up the cultivation of paddy, do you re-transfer it to *jarayat* at the expiration of the settlement?—Yes.

248. Q. (Mr. Muir-Mackenzie)—You said there were sites for constructing new tanks; but I understand that small tanks are found all over the Surat district?—All over Gujarat.

249. Q. You don't mean merely *bandhs*?—No, tanks; though *bandhs* are very useful also.

250. Q. (Mr. Ibbetson)—A *bandh* is a long bund across a slope or shallow drainage?—Yes. They exist in the Ahmadabad district, it has a peculiar form of cultivation under them. In the monsoon the impounded water is let off in rice beds on the other side of the *bandh* and in rabi excellent crops of wheat are grown in the area where water was impounded during the monsoon.

251. Q. (Mr. Muir-Mackenzie)—There are in Virangaum and Ahmadabad large number of *bandhs* doing useful work?—Yes.

252. Q. You speak about the deepening of existing tanks or the making of new *bandhs* on the sites you have described; do you think that would be a good form of work in famine?—Yes.

253. Q. Have you any suggestions to make as to improving the existing *takavi* rules?—No. I have no direct suggestions.

254. Q. Indirect; you have heard what the people say?—The distribution should be made by some responsible officer, and the leakage stopped.

255. Q. (Mr. Ibbetson)—At present who actually makes the distribution?—More or less the lists are prepared by Talatis, Mamlatdars, and Aval karkuns. Such investigations as are necessary ought to be made in every village by higher officers, who should see to everything, the area of land, the selection of people, &c. Money should be paid in instalments as the work progresses.

256. Q. (Mr. Muir-Mackenzie)—How many *kachcha* wells are there?—In *gorat* tracts many *kachcha* wells were dug during the famine year.

257. Q. Are they valuable?—They are highly valuable for growing fodder.

258. Q. How early in the year ought one to know whether famine ought to be expected?—I think by the end of October.

259. Q. Must you wait so long?—In Gujarat we do not get much rain after October. I think we must wait till we get the *Dewali* showers.

260. Q. Must you wait so long; would you not begin to build *kachcha* wells at once?—Yes; if the rains hold off you might begin earlier. A *kachcha* well would cost from Rs. 15 to Rs. 20, and would save valuable crops.

261. Q. Suppose there is a failure of the rainfall of a district by the end of September; would it be advisable to give advances at once for *kachcha* wells?—Yes.

262. Q. You think the more wells made during a prosperous year, the better it would fortify the country against famine?—Yes, that is so.

263. Q. Do you not think that the cultivators would be more inclined to take advances from Government, if they had not to repay the principal but were made to pay an enhanced assessment?—I think they would consider that the worst form of repayment.

264. Q. Why?—Because sometimes they borrow only a portion of the money from Government; and if they grow a good crop, they repay the debt as soon as possible. An enhanced assessment would be a permanent charge and a burden on their children. A man would rather do the thing himself or leave it alone.

265. Q. He would not like the idea of an enhanced assessment?—No.

266. Q. I suppose you are aware that a number of wells are made in the Native States on that principle?—Yes, but I do not consider comparisons of Native States with our territories very satisfactory. In Native States the rules regarding loans, &c. are not hard-and-fast; they are very elastic.

Mr. P. R.
Mehla.
3 Dec. 01.

WITNESS No. 13.—MR. C. V. VERNON, I.C.S., Assistant Collector, Ahmadabad.

Answers to printed questions.

I.

3. Breach.—I have only known the district since January 1900, and therefore cannot say whether small tanks would hold water in seasons of average rainfall. Very many were dry in 1900.

I have seen high earthen dams made of such soil at Mataria, Dora, Tankari, etc., but noted that there is a great tendency for large fissures to form after the first heavy rain.

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I should say that in the black cotton soil of Broach there is absolutely no demand for water for irrigation at any time except in seasons of drought. It is only in such seasons as 1899-1900 that the owners of black cotton soil think of irrigation and then chiefly as a means to tide over the year, e.g., by raising fodder crops for their cattle. I believe tanks for irrigating such soil are considered both unremunerative and unimportant.

6. Village and district irrigation works are, so far as I know, constructed by the Public Works Department in the Ahmadabad District. I doubt whether the responsibility of Government in connection with their maintenance after they have once been constructed and the rates fixed is at all clearly defined. It is the case that rayats continue to pay for water advantages which no longer exist or in years in which no irrigation water is received. I have not heard of remissions being granted for any other reason than that the holder was absolutely unable to pay. District Boards repair irrigation tanks when these are also used for domestic and cattle-watering purposes; not, I believe, otherwise. District funds could not bear the burden unless extra revenue were assigned to them.

I have known instances of irrigation tanks and bunds constructed by private landowners. I may instance the bund, channel and tank in the village of Mankol, constructed for the irrigation of rice land by Jeysing Hathesing, the owner of the village; also a big rice bund constructed by the Thakor of Sanand at Devti Moti, where irrigation is carried on by jheel from a long slip of water impounded by the bund. There are of course other instances where the landholder has sufficient capital, but in case of small holdings organization is difficult. Takavi can be given for such purposes, but allotments exceeding Rs. 1,000 are in practice extremely rare. The up-keep of all tanks and bund irrigation works certainly requires greater attention. The danger in encouraging the construction of new works consists in the fact that it encourages the conversion of dry crop into rice land which experience has hitherto shown to be a very speculative undertaking. Of course if the system could be improved so as to secure a tolerably certain supply of water, then this objection would disappear. The chief source of water-supply for cattle is at present tanks and these are very liable to run dry before the hot weather, the time when they are most needed. Drinking troughs attached to wells then take their place; a system which could secure a tank supply in the hot weather would be a boon. In Sanand very many irrigation tanks are also used for watering cattle.

7. In such talukas as Sanand wells are a profitable speculation in many parts, and even in the present year existing ones are largely in use.

In Vagra taluka, Broach, where the sub-soil strata are largely salt, I believe a very large proportion of the wells constructed during the famine were failures.

8. *Broach District.*—The Bára tracts to the west of Jambusar, Vagra and Broach talukas.

Water-logging has been a complaint for many years and many drainage channels were constructed both before and during the famine. More could be constructed with profit, but the up-keep of existing ones is still more important. They probably do not result in any immediate increase of revenue, but might prevent considerable loss in bad seasons.

9. In Broach, north of Narbada, relief works consisted chiefly of large village tanks for watering purposes. The cost was wholly incommensurate with their utility. There were also drainage channels. One or two embanked road works were started, when the rains made tank work impossible. South of Narbada several irrigation tanks were repaired and metal quarried for two important lines of road. Of the tanks constructed in 1899, some hold water (e.g., in Broach, Tankari Sarbhan, Shigaon, A'mod, Dábha) and some do not (e.g., in Broach, Dora, Mátaria i.e., in 1900-1901), and in Ahmadabad, Shiawara (though a very large tank). Apparently the bottom takes some time to settle, so that it is too early to speak with confidence. It seems certain that the process of siltation is often very rapid and that practically nothing is done to stop this, e.g., in way of water-gates or siltation tanks.

II.

A.—General.

1. I have served in Ahmadabad, Surat, Dhárwár and Broach. The answers will relate mainly to Ahmadabad and Broach. In the former district I have held charge of

Daskroi, Parántij and Modása for a year (1897 May to 1898 May) and of Viramgám and Sanand for a few days. In the latter district I held charge of Vágra, Ankleshwar and Hansot from July to October 1900 (i.e., in the rains) and of Jambusar, A'mod and Broach from February till August 1901.

3. (4) In Broach the black cotton soil (north of Nur-badda) is believed to be unsuited for irrigation. It is also believed that irrigated cotton does not thrive. The experiment is rarely made. Rainfall rarely fails. In 1899-1900 a considerable number of wells were constructed to raise (1) fodder crops, (2) such garden crops as onions. The soil, being full of cracks and holes, takes very much water and except for years of utter drought the cost is probably incommensurate with the profit. In all ordinary years cotton occupies the soil for the greater part of the fair season. In Káli (Daskroi) I have this year seen a cotton crop irrigated from a well.

(6) The initial expenditure is necessarily heavy for owners of small rayatwári holdings and cannot be met where the people are much in debt.

(9) Lack of enterprise in making *kachcha* wells, e.g., Koli cultivators. Lack of proper organization in constructing tanks and bunds by private enterprise.

4. So far as I know improvements are exempted from taxation during the period of the next Revision Survey (Section 107, Bombay Land Revenue Code). As to whether distinction between "holders" and "tenants" improvement is made I know nothing. I am of opinion that there should be no such distinction.

The provision of the law must be known to the people, but their view is likely to be affected by the fact that (in Ahmadabad) revisions have usually meant enhancements for other reasons.

5. Before the famine of 1899 the Ahmadabad cultivators (e.g., Parántij) were unwilling to take advances, because they thought the collection system would allow of no exceptions. I believe that the famine (with the liberal advances of takavi and the remission of interest) has materially altered their view, so that there are few who are not glad to get takavi. The difficulty now is (with the staff available) to distinguish the deserving cases quickly enough.

5. (1) (2) (3) No, not in ordinary seasons.

(4) Is hardly possible, because the actual expenditure would be hard to estimate. Again it might set a premium on bad *bandobast*.

(5) The period allowed by law is sufficient except where one famine or scarcity follows another.

(6) In famine times part may be remitted (e.g., in rice tracts where there have been two or more successive failures).

6. The people (in Sanand) have been very keen in the past on obtaining facilities for conversion of dry crop into rice land. The recent repeated failure of rice may check this.

D.—Tanks (Ahmadabad).

23. (1) Largely by rainfall, also by such irrigation channels as the Khári Cut supplying Chandola Tank (taluka Daskroi).

(2) By channels where the level of the water is high enough; otherwise by jheels (e.g., taluka Sanand—Irrigation channel and bund in Mamkol village constructed by the owner of the village who is an Ahmadabad Bania). In Viramgám I have seen a case in which a double jheel was used, raising the water first to an artificial basin and thence to the required level.

(3) (a) (b) (c) In years of drought and scanty rainfall such sources are likely to fail. In years of moderate or ample rainfall they tide over the breaks and serve to keep the crop wet after the rainy season is over.

24. (1) I believe two crops are rarely, if ever, grown one after the other in the same season on the same land.

(2) Irrigated rice when it succeeds is believed to pay much better than dry crops.

26. When the tank gives out wells are sometimes used, e.g., a lot of Kamod rice is now being irrigated from *kachcha* wells in the village of Upardal, taluka Sanand. I do not know whether there is much of this, but certainly it is wholly exceptional this year in Sanand, perhaps because the tank supply was not sufficient in most cases even for sowing the crop.

29. The private owner has to construct *kachcha* channels to the source of supply and must also surround his land with a bund to keep the water in. In the hilly parts of Dhárwar the tank is often at a high level, and terraces of rice land one below the other are constructed by the owners.

30. Tanks and bunds constructed by the Public Works Department are usually repaired by that Department often with the help of a contribution from the rayats. Dhárwar employs a special Engineer for the purpose. I do not know whether there is a proper system in Ahmadabad for keeping repairs up to date. On this point the Executive Engineer can give evidence.

32. In the case of poor Talukdars and Inamdars grants-in-aid or tagai advances might be given. In a village of the Karajgi taluka of Dhárwar I once negotiated a loan of Rs. 2,000 to a big cultivator for construction of a rice tank. I remember rightly he had previously received Rs. 2,000 for a similar purpose and was paying up promptly.

33. I can give no definite information but believe the whole tank does silt up in course of time. When the tank is once filled, there should be some system for shutting off any further inrush of water which would only bring in silt.

E.—Wells (Ahmadabad and Broach.)

34. (2) Experimental wells often turn out salt, especially in such tracts as Viramgam (District Ahmadabad) and Vāgra and Jambusar (District Broach) which are near the sea or a salt Rann.

(3) *Kachcha* wells Rs. 5 and upwards; *pakka* wells Rs. 250 and upwards.

(5) By a leather water-bucket hanging from a pulley and raised by a pair of bullocks.

35. (1) I have not heard of two harvests being raised on the same land, but where rice has failed wheat has been raised by means of a well (e.g., Kethal, taluka Sanand).

(2) Wheat and rice are usually more valuable than dry crops.

(3) In years of scanty rainfall and drought wells are sometimes the cultivator's only stand-by.

38. (1) Great difficulties are encountered because the character of the sub-soil water is so capricious. The people, however, soon learn where sweet water can be had, and a *kachcha* well is not costly.

(2) In the Broach District and in Sanand and Viramgam of Ahmadabad I believe rock is rarely, if ever, encountered. Sandy soil sometimes presents difficulties, as the well is likely to fall in. This difficulty is obviated by the construction of a circular wooden framework which is inserted below the level of the masonry.

Where *kachcha* wells can be made so cheaply I think boring tools are of little or no use, especially as the ordinary boring implements are very heavy and cost a good deal to move and also are, I believe, liable to break if not skilfully manipulated.

40. Temporary *kachcha* wells are a good deal used in parts of Sanand and parts of Modasa. They cost very little and advances to construct them are of great use, though it is difficult to select the proper cases.

Note.—The Government Resolution under reference was received by me late last night and was only read through to-day. I have, therefore, experienced some difficulty in putting such experience as I have lucidly together. Most of my Ahmadabad experience was in a first year of district life. In Broach there was famine and in Dhárwar a very severe plague epidemic which engrossed all attention.

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1. Q. (*The President*).—You are Assistant Collector, Ahmadabad?—Yes, from 1896 to 1898 I have been Assistant Collector here.

2. Q. You have been Assistant Collector at Surat, Dharwar and Broach?—Yes.

3. Q. Where were you in famine?—In Broach.

4. Q. Was the famine severe in that district?—Yes, very severe.

5. Q. What do you think will be the best thing to do for this district in order to protect it against famine?—Much need not be done for the reason that in a district like Broach scarcity and failure of rain is very uncommon; famine has occurred once in a century. The crops are very valuable in ordinary years, especially in Broach where cotton is grown. It would not be worth while endeavouring to ensure protection by irrigation schemes.

6. Q. Would they grow fodder by irrigation?—The fodder question is a difficult one, they would grow fodder by irrigation if the sub-soil water is good.

7. Q. Do you see any way out of the difficulty?—No, except fodder can be brought by railways from elsewhere.

8. Q. From where would you propose to bring it?—From the Central Provinces.

9. Q. Could you not grow it here; is there not sufficient land available?—There is very little waste land. In the famine of 1899 fodder did not grow, it dried up. We had only about 5 inches of rain and fodder could not be grown.

10. Q. The best policy for Government to pursue for a district like Broach where famine comes only once in 50 or 100 years would be to relieve the distress when it comes?—Yes.

11. Q. Do you advocate drainage in your district?—Drainage channels are used in this district; a good many have been made since 1894; they were made both before and during the famine; but there are still water-logged areas in several talukas; they were water-logged even for a considerable part of the season in 1900.

12. Q. Are you aware of any objections being raised to these drainage channels? I quite understand the objection in dry years?—I have not heard of any objections.

13. Q. Is there a feeling among the people that these drains should be made?—Some of them were made on the representations of the people. Last year while travelling through the Broach taluka I had two or three applications for certain drains.

14. Q. (*Mr. Ibbetson*).—Did you say last year?—Yes.

15. Q. (*The President*).—That was during the time of scarcity?—No, it was not in the year of scarcity; it was after that.

16. Q. Are they on a large scale?—No.

17. Q. Are they ten feet wide?—About that I think.

18. Q. Do you know whether they were carried out as famine relief works?—Yes, some were.

19. Q. Are the people generally well off?—They are all in debt; though the crops are rich, the people are poor.

20. Q. You say here in reference to the Ahmadabad people before the famine that "they were unwilling to take advances." Is that your experience in regard to takavi?—Not here, I have only come back here recently.

21. Q. What was the case in Broach?—They clamoured for takavi, but not so much for wells.

22. Q. For cattle and seed?—Yes, the difficulty is that the applications all come in one month and are very difficult to decide.

23. Q. Is there an increased demand for takavi for the construction of wells?—Yes, there is; a good many wells were constructed in Broach during the famine.

24. Q. Would people rather take takavi advances or go to the *sowcar*?—I do not think there is any unwillingness to take takavi; but my experience is rather limited.

25. Q. (*Mr. Muir-Mackenzie*).—Before the famine very little takavi was asked for or given?—I know that before the famine I tried to induce the people to take takavi, but they would not; they said that Government would take it back when the instalment time came but that the *sowcar* would wait; and therefore they would sooner have it from the *sowcar*.

26. Q. (*The President*).—You mention in your second paper, paragraph 3, that "In Kali (Daskori) I have this year seen a cotton crop irrigated from a well." That must be a very peculiar circumstance?—Since then in the western portion I have seen very many crops of cotton irrigated from wells. I asked the people and they said that it was not done in the pure black soil, but only in the yellow soil and when the rainfall was scanty. They said it had kept off rats.

27. Q. Have you seen irrigation from tanks of anything besides rice?—I do not think I have.

28. Q. In paragraph 26 you say "when the tank gives out, wells are sometimes used."—Yes.

29. Q. You say *kamod* rice is grown by well irrigation?—Yes. In one particular village they grow 10 acres of *kamod* rice; it was irrigated from a tank—it was a fairly good tank—up to perhaps the end of September; when I got there I saw the wells irrigating it.

30. Q. Do you know how deep the water was?—No.

31. Q. It must have cost a great deal of labour?—This village is largely in the hands of a particular *sowcar*.

32. Q. Have you any personal experience in regard to wells in rock having failed?—There are no rocks in the

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Broach district as far as I know. I have not heard of any difficulty of that kind.

33. Q. (Mr. Higham).—In regard to small irrigation tanks you observe that the District Funds would not bear the burden unless extra revenue was assigned to them?—Yes.

34. Q. Do you think that the District Board should be called upon to undertake the works and have extra revenue assigned to them or that Government should undertake to do it?—Better that Government should do it, and not the District Board.

35. Q. Have the District Boards not the advantage of local knowledge?—I do not see that they have the advantage of local knowledge; Government have as much knowledge as the District Boards. In any case an Engineer, I suppose, would have to carry out the work either for Government or for the Local District Boards.

36. Q. It will have to be done by an Engineer?—I suppose so.

37. Q. Have the District Boards or Local Boards their own Engineers?—As far as I know the Local Boards have only overseers; the Executive Engineer looks after big schemes.

38. Q. I am speaking of small ones. Could the Collector undertake the work?—He could do it, I suppose, through Civil Agency, but he might need professional assistance.

39. Q. If it is decided by the Engineer how much work is to be done, could the Collector get it done by Civil Agency through the village headman?—I think he could do so but I cannot say; it would be well to have supervision by the Public Works Department to see that the thing is done.

40. Q. Would it be difficult for the Revenue Officers to look after the work?—I think it would.

41. Q. (Mr. Ibbetson).—Are they going to open relief works in Broach this year?—I should think not; I think the district is fairly well off.

42. Q. Suppose famine was to occur in Broach suddenly: are you prepared; have you had any surveys made?—I think the Executive Engineer has prepared schemes, which can be supplemented by works for the construction of small channels. I have had representations made to me by people here and there for these.

43. Q. I suppose the Executive Engineer is generally in possession of information?—I really do not know.

44. Q. Do you think it advisable to try the cultivation of rice on any large scale?—From my experience of this district I can say that the rice crops have failed here for the last four years.

45. Q. In fact the whole of your experience in India has been in bad years?—Yes; to some extent.

46. Q. Was 1897 a bad year?—It was not a bad year, except for rice.

47. Q. Did the rice fail?—The rice crop was very poor; the other crops were fairly good.

48. Q. At any rate the average has been fair to normal?—Yes, but I think it would be rather a risky speculation to turn more land into rice land in a country where the rainfall is always under 30 inches.

49. Q. You say "wells are a profitable speculation," are wells a profitable speculation in any large proportion in the Broach District?—No, I should not think so.

50. In a small proportion?—Perhaps to the south of Broach, where it is more like Surat.

51. Q. What proportion is that of the whole?—About one-fourth, I should think; it may be more.

52. Q. Is there room for the extension of wells?—I do not know; it is a difficult country.

53. Q. You say as regards the exemption of private improvements from enhanced assessments: "So far as I know improvements are exempted from taxation during the period of the next revision survey." Is that based upon actual knowledge of your own. Have you found that people have doubted that there will be exemption?—Perhaps it is rather hard to say.

54. Q. You have no definite information?—No.

55. Q. You say as regards takavi "the difficulty now is (with the staff available) to distinguish the deserving cases quickly enough"?—I should like to qualify that. In the case of takavi the question is whether a man is solvent or not.

56. Q. Why?—He is to be paid an advance.

57. Q. He pledges his land?—We must know how far it is mortgaged; or whether the land is his land.

58. Q. Is not the loan on the land for irrigation the first charge on the land?—Yes, it is; I believe there is some law that when takavi is given the persons interested should be informed; I am not quite sure about that. My idea is that we should not defraud the earlier creditors.

59. Q. You do not defraud the earlier creditors by taking the land as security?—Well, one does feel that way.

60. Q. Is that the strongest objection?—I do not know, I do not think it causes much delay if a man has not got a mortgagee in possession he would probably get his loan without much trouble.

61. Q. You say it would be hardly possible to remit an advance made for digging a well in case the well fails, because the actual expenditure would be hard to estimate. Suppose a man digs a well and finds salt water, would you advocate remission of the advance?—The people know to a great extent the areas in which they can find water and those in which they cannot. Sometimes they make a well and find brackish water, which damages the land in the long run; I think Government might remit in that case.

62. Q. You don't think it should be always done?—No.

63. Q. You say "where *kachcha* wells can be made so cheaply I think boring tools are of little or no use," do you mean boring with a drill?—Yes, a sort of a drill; it is a very heavy instrument.

64. Q. (Mr. Rajaratna Mdlr.).—In paragraph 8 of your first note you say "many drainage channels" were constructed both before and after the famine; would the drainage channels cause loss of water in a bad season; would they drain away the water too fast?—Yes.

65. Q. (Mr. Ibbetson).—A bad season would be a season of heavy rainfall?—Yes, in some cases.

66. Q. (Mr. Rajaratna Mdlr.).—It may have the effect of benefiting the crops in some cases?—Yes.

67. Q. In your second note, in paragraph 4, you say "the provision of the law must be known to the people, but their view is likely to be affected by the fact that (in Ahmadabad) revisions have usually meant enhancements for other reasons." What are the "other reasons"? Is the enhancement very high, comparatively?—It varies in different parts. In the Sanand taluka it is about 30 per cent.; not less.

68. Q. If there were no enhancement, do you think that would give a stimulus to the extension of well irrigation?—I do not think they are unwilling to build wells.

69. Q. In your second note you say "the period allowed by law is sufficient, except where one famine or scarcity follows another?"—That is largely with reference to the grant of loans for wells.

70. Q. What is the period allowed for the repayment of loans for agricultural purposes?—Two years for bullocks and seeds; that is the usual rule; it may be relaxed by Government.

71. Q. In paragraph 6 of the same note you say "the people (in Sanand) have been very keen in the past on obtaining facilities for conversion of dry crops into rice land. The recent repeated failure of rice may check this." What is the "recent repeated failures"?—A succession of failures of rice.

72. Q. (Mr. Muir-Mackenzie).—Do you think that there is any kind of relief work, better than the repairing of roads or the constructing of new tanks, to be undertaken in times of famine?—I think there is no better form of relief work than irrigation tanks.

73. Q. Large or small?—Small would be the most useful.

74. Q. I am talking of new tanks?—Then, I do not know.

75. Q. Do you think the multiplication of wells north of the Nerbudda would add to the security of Broach against famine?—I do not think so.

76. Q. For the irrigation of cotton?—I do not think so; they would not irrigate cotton at all.

77. Q. Not even in a famine year?—It might be worth trying.

78. Q. You would advocate *kachcha* wells below tanks?—Yes.

79. Q. The multiplication of tanks would facilitate the construction of *kachcha* wells?—It would; they would get water more easily than other wells.

80. Q. Have you seen a good many water-logged areas?—I have seen certain areas in Broach and Ankleshwar, in the Broach District, and some areas in Viramgaum.

81. Q. Do you think any permanent improvement of these areas may be effected, so far as the normal seasons are concerned, by constructing drains?—I believe so.

82. Q. You are inclined to approve of them?—Yes.

83. Q. Do you think that prior to the famine the objection of people to take takavi was due to the rigidity of the collection?—Yes.

84. Q. Do you think it would be any improvement if instead of giving takavi in the ordinary way for wells, Government gave the rayat the whole money and charged him *bugayat* assessment?—It would have to be very carefully explained to the rayat.

85. Q. Would you advocate the sinking of trial shafts for wells by famine labour?—I am afraid not. The people know very well where they can get sweet water and where they can't.

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Vernon.

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WITNESS No. 14.—A. E. L. EMANUEL, I.C.S., Assistant Collector, Ahmadabad.

Answers to printed questions.

I.

Point 4.—Besides the Sábarmati, other possible sources of irrigation are:—

- (1) The tributaries of the Sábarmati in Modása and Parántij talukas, *viz.*, from east to west in order, the Watrak, Majham, Meshvo, Khari (mainly canalized), Hathmati (canalized already).
- (2) The Bokh rift and lakes in Parántij—already the subject of a large project.
- (3) Various smaller streams, as the Dhámni and others in south Modása, the Luni in Parántij, the Rodh in Sanand and Dholka, streams at Upardal, Juhár and Devti in Sanand, at Bhekda, Kamlej and Khareda and elsewhere in Gogho, at Walthera in Dholka, at Mandal in Viramgaum.
- (4) Nallahs running into the Sábarmati and other rivers.

With the exception of the Meshvo, middle and lower Khari, and greater Bokh lake, these sources all ran almost or quite dry in the famine, and therefore at another place I have stated that little water, except in the Sábarmati, ran to waste in the famine. However, in better years water could no doubt be retained.

I should perhaps have added (5) a good deal of surface water running into the Nal salt lake in Viramgaum, Sanand and Dholka, which might be caught into tanks or otherwise held up.

In Modása (especially the north), and in Gogho, rock and hard ground will offer some obstacles to irrigation, and in most of Modása the population is too wild to take much advantage of irrigation.

Point 7.—In the famine of 1899-1900 grants were made in each district for improving village water-supply. In my charge (Parántij and Modása) these were used to deepen a good many village drinking wells, which has run quite or almost dry—with successful results.

Takavi was used to deepen irrigation wells. In Modása, however, many irrigation wells which ran dry were dug and blasted without reaching water. In spite of this, almost the only crops in Modása were a few patches round the surviving wells, sometimes only one patch in a village. A few villages, though, had not a rood of crop.

Point 8.—Much of Modása Mahál east of Dhansura is a collection of small holes in which the water evidently logs in wet weather. The draining of this would, I believe, fit a large tract for cultivation, but there is not at present the least call for land in that neighbourhood and the population is sparse and rude.

Many villages of Sanand and Dholka, I remember, used to complain of water-logging or of the entry to the village or some particular bottom being flooded annually. I think Siavada in Dholka, and Kalava in Sanand are instances. Near Bagodra in Dholka are rushy swamps which draining would make cultivable. One is marked 'Hate! lake' on the map, another the 'Kala Nal'. The land is alienated land.

The south and east sides of Viramgaum town are swampy, and draining them might improve the health of the place, just as Dholka and Ahmadabad have doubtless been improved by drainage cuts.

Local and Municipal Funds could be used for the smaller of these works.

Possibly the banks of the Nal itself might be drained for dry crops and the outline of the lake proper thus defined, instead of its shading off into ready wastes.

Point 9.—I have often been told by villagers of little bits of work left undone or mischief caused in famine excavations. The Viramgaum drains especially seem to have interfered with the feeders of many village tanks. No doubt further attention could dispose of these derangements. Sometimes the high drain banks seem to have held off surface water from neighbouring fields.

Some of the tanks dug in the famine are, I believe, most valuable improvements to irrigation, *e.g.*, Butal in Modása, but many so far from being useful even as drinking and washing reservoirs, or air-refrigerators, seem to have missed their supply, perhaps had too narrow an entry or one wrongly placed, and dried up at an inexcusably early date. I might instance Valokad in Gogho and Gota in Deskroi. I believe many of the village works were in the hands of incompetent or indifferent Sub-Overseers. Sluices are, I believe, still wanted in many tanks.

II.

General.

1. My answers refer to the Ahmadabad District, with 7 out of the 8 talukas of which I have become acquainted, as follows:—

1898-99—Charge through the travelling season and into the famine of Sanand and Dholka talukas.

1899-1900—Charge, throughout the famine, of Parántij and Modása.

1900—Two months' travelling in charge of Viramgaum.

1900—A few weeks' travelling over Gogho on Plague duty.

1897-1901.—Travelling about the home, taluka Deskroi, occasionally for various purposes.

I do not know the Dhandhuka taluka.

2.

3. (1) No.

(2) No.

(3) Possibly, for although manure is at a discount at most of the Municipalities, cattle-dung is the chief fuel and is not easily carted over the lands of large villages.

(4) This objection may hold in the black soil country of the Bhal (in Dholka and Dhandhuka). In many parts irrigation will evoke salt.

(5) No, except in so far as famines threaten.

(6) No doubt in many parts.

(7) I do not think so now that there is a sub-soil assessment.

(8) The small holdings of the rayatwari system make against any such application of capital on a large scale as most irrigation implores.

(9) Want of large holdings, capital and enterprise generally. I think possibly more than one Sábarmati canal might be dug in the Dholka taluka, otherwise not much water is wasted in a famine year. Salt makes much water useless for irrigation.

4. I think the assessment of sub-soil water, if properly effected, a sufficient inducement to irrigation as far as taxation is concerned.

5. Fairly freely, but not nearly so freely as they might be. I think cultivators fight shy of indebted themselves to

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Government as they know they will have to pay one day, whereas a 'sávkár' will not foreclose if he can help it. However, Government could not think of adopting the sávkár's method of high interest and should, I think, ease the burden by—

(2) remitting interest altogether, and giving the cultivator to understand that the principal is strictly returnable if not sooner, then later. Government has no object in expecting a fiscal profit on the money laid out in takavi, and should in this way try to beat the sávkár.

I think (4) would be a temptation to dishonest cultivators, who, if they do not know where water is, should be encouraged to find it in other ways than by land improvement loans.

Grants-in-aid will not go far enough.

6. I found people in Sauand and Dholka constantly asking to have their irrigation tanks mended and also to have large sloping areas of surface water held up by long 'bandhs'.

The people of the Sábarmati villages were very keen to have Mr. Pandit's river-side pump imitated when Government were pushing such a scheme.

7—22.

Tanks.

23. (1) I think nearly all the tanks of the district are very old. They have evidently been formed by—

1. Damming streams,
2. Letting an earthen wall across a natural depression or sloping area,
3. Deepening swamps, or
4. Damming nallah by,

and fill themselves accordingly.

A few, like Wasna Dhedhal, have had channels dug to fill them.

(2) The water is generally raised by a "dhekudi," or bag hung from a staging and distributed by "pats" among the fields to be watered. The principal "pat" may be banked up very high and with the help of stones, and sometimes has a sharp fall.

(3) A tank should be full at, say, the end of September, after which it lasts according to its shade, bottom and capacity for from five to 12 months, and this period is shortened in proportion to the severity of a drought.

(4) Say 100 acres on the average.

24—28.

29. Besides making channels for the water the fields have to be smoothed and banked to hold the water. I believe the landlord usually prays for this, when there is one.

30. Most of the irrigation tanks proper are in the hands of the Public Works Department for repairs and up-keep, a few are 'village tanks,' and as such chargeable to the Local Board and Municipality. These three bodies excavate silted up tanks as they can, with the help of village contributions, which are asked for as a condition of repair wherever possible.

The result of the system possibly is that the villagers lose their sense of responsibility for the up-keep of the tank (though they might argue that they have to pay taxes and cesses), and will rather let a tank become nearly useless than give it any gratuitous labour. If the village would spare the labour to do up its own tanks each dry season, very few big jobs would be needed.

In Sanand and Dholka and elsewhere I heard constant complaints of Public Works tanks becoming useless for want of repair. The local funds recently have been practically 'nil.'

I remember Mr. Gibb, Collector here, asking Government, I think successfully, to give up buying water-rate for lands irrigated from Public Works tanks nominally useful but really become quite insufficient.

Possibly something could be done in the direction of helping the villagers to work annually instead of letting a few tanks get into such a state that big excavation or mends are needed at long intervals. "Recurring expenses" for tanks are unknown in Local Board budgets.

31. I only remember the one instance of a Kunbi, named Ambaram Panja, who got a concession from Government to train a snipe marsh at Sauand. Part of the water was to go to form a tank. There was much local opposition, people saying they would be robbed of their

water, or else water-logged. They were quieted, and Ambaram was forced to make reasonable provision for them.

32. If a land-holder is sufficiently big, i.e., has enough land for it to be worth his while to make a tank, I think he should be given every encouragement; but a well should be better than a small tank, as it would generally tap the same supply and will conserve the water better, being underground. I think it would not be too great a concession to the builder of a serviceable tank to remit him the assessment of its area in return for a very moderate occupancy price.

33. I do not think they silt up very fast. Villagers are constantly asking for their tanks to be dug out because they get paid for the labour.

Silt is valued as a manure by the villagers and often taken for that purpose. Tanks are periodically dug out as mentioned in the answer to question 30.

Wells.

34 (1) Sanand and Dholka 50 feet, Parántij—30 feet.

(2) Everywhere percolation is the usual source and springs are rare.

In Modása many of the wells failed in drought.

In Viramgaum and Dholka wells may go silt at any time with little warning, and very many of the wells are brackish. Round the 'Nal' lake the comparative freshness of the water-supply is entirely dependent on the annual rains.

(3) Rs. 600 for a masonry well.

(5) By staging, bullock pulley and leather bags. Occasionally (especially in Viramgaum) a see-saw hand-lift, with a lump of mud as a weight at one end of the lever to counterbalance the water-bucket.

(6) Ten acres.

35. (1) Many a rain crop (e.g., 'makai') can be repeated in the winter by means of irrigation.

(2) A cultivator will, if he can make a 'kyardi' of his 'jirayat' land, or some of it. He will do this for the sake of such a (in this district) speculative crop as rice.

(3). (6) (c) A well in a drought will supply the deficiencies of the rain harvest. This was universally the case this famine.

38. (1) In Sanand, Dholka and Viramgaum there is often great difficulty, and many experiments have to be made in finding a place where a fresh water well can be found. Salt water can generally be found.

In Modása and some parts of Parántij the presence of rock makes water-finding very precariously.

I think the Commissioner's present measures to encourage borings are the first in this district, and are still in progress. I think the loan of boring tools, blasting powder, etc., for experiments can do nothing but good.

The assignment of famine labour for shaft digging, which, I believe, was tried in the Deccan, seems also unobjectionable, if properly supervised, but loans of takavi for patently experimental diggings are, I think, too unsafe in this district.

39. No. I think Government might as well plough a cultivator's land for him and hand him over the proceeds. Perhaps the following plan might be feasible: for any good reason land might be temporarily attached, a well dug in it, and the land returned to the same or another cultivator after expenses had been recouped from the irrigated crop.

40. The dry beds of tanks were let out on special terms during the famine, and the rich land gave a good crop from temporary wells. In some villages these patches were the only cultivation.

In Parántij where the sub-soil water of many villages is only a few feet down, temporary wells were dug in all directions and were of the utmost value. They had a great tendency to fall in, the soil being sandy, but could be boarded or bushed up.

In the same way many temporary wells appeared in river beds or river 'bhatha' land.

A cheap rate for unassessed land irrigated in these ways and ready 'takavi' for the work of construction are, I think, the best ways of encouraging temporary wells.

1. Q. (*The President*).—You have been Assistant Collector of Ahmadabad since 1898?—Yes.

2. Q. In paragraph 3, section G, you say "No doubt in many parts." What do you mean exactly?—I believe if you allow water to the whole neighbourhood, it will evoke salt in many parts.

3. Q. Is that your experience?—I cannot remember exactly where I got the idea from first.

4. Q. Do you think the construction of wells would be furthered if increased facilities were given for advances?—I think so, to a certain extent, but not much.

5. Q. Have you had any experience of giving advance of takavi?—Yes, especially at the close of the famine.

6. Q. What was the exact *modus operandi*?—The village officers sent up names of applicants which were tested; we had the whole village up *en bloc*, and gave out the money for seed.

7. Q. Were there special arrangements to give money very quickly?—Yes.

8. Q. As regards wells, what would be the exact process?—A cultivator sends a petition; we send it to the Mamlatdar for inquiry through the lower officers, and according as they approve or not we give the money or withhold it. The Assistant Collector sees the site if possible beforehand.

9. Q. Would you encourage them to ask for takavi advances?—Yes.

10. Q. Do you suggest it to them or advise them to take it?—I often got the villagers together and suggested it to them. I told the Mamlatdar to induce them to take takavi.

11. Q. How long does it take between a man's sending an application and getting the grant?—That depends upon the officers. I should think a fortnight at least. You have to see before giving money whether the land is already encumbered.

12. Q. (*Mr. Ibbetson*).—After what period does he get the money?—It would depend upon the energy of the subordinate officials.

13. Q. Would six months be abnormal?—Yes, that would be abnormal.

14. Q. Three months?—Three weeks or a month would be the usual time; inquiries as to encumbrances have to be made. It has been suggested that a man might be sent with rupees to give them on the spot.

15. Q. Is that ever done?—I do not think it is actually done; the Assistant Collector gives an order to pay at the local Treasury.

16. Q. (*Mr. Muir-Mackenzie*).—That is still done? I think the latest system is that the Mamlatdar carries the cash with him?—That was at the end of the famine when money was wanted quickly.

17. Q. (*Mr. Ibbetson*).—That was for seeds and bullocks?—Yes.

18. Q. Are you sure that the takavi is paid through the taluka Treasury?—It is always done.

19. Q. (*The President*).—You say "I found people in Sarand and Dholka constantly asking to have their irrigation tanks mended and also to have large sloping areas of surface water held up by long 'bandhs.'" I do not suppose these "bandhs" require great labour?—No; I do not think so; they require to be put carefully in the proper place.

20. Q. I suppose a great number of irrigating tanks were mended in the famine?—Not a great number.

21. Q. You say "the people of the Sabarmati villages were very keen to have Mr. Pandit's river side pump imitated when Government were pushing such a scheme?" Mr. Pandit, I suppose, had got engines and pumps?—Yes; from them he irrigated about 200 acres; and in consequence of his success Government thought of preparing similar pumps.

22. Q. He took the water from the river?—Yes.

23. Q. Did he make any private arrangements with the cultivators for pumping?—Yes.

24. Q. You say the tanks are capable of irrigating only 100 acres?—A great majority of them were small.

25. Q. Did they help at all during the famine?—They must have; some of them helped the cattle, as finally the cattle had to be given water from holes in the tanks.

26. Q. Mr. Pandit pumped up from wells in the river bed?—Yes.

27. Q. You say "if the village would share the labour to do up its own tanks each dry season, very few big jobs would be needed?"—Yes; but I do not know whether it would be right to expect the people to do this, since they pay water rates.

28. Q. In Sanand and Dholka you heard people complaining of the Public Works Department tanks becoming useless for want of repairs. The local funds recently have been practically "nil." Did you send up any case to Government?—I wrote to the Executive Engineer, telling him that the people of such and such a village were complaining about the tanks being in disrepair, and generally I found that the reason for non-repairs was that the village contribution was awaited.

29. Q. If the people were anxious to get the tanks repaired, were they not anxious to pay a part of the expenses?—I don't know.

30. Q. You say "if a landholder is sufficiently big, i.e., has enough land for it to be worth his while to make a tank, I think he should be given every encouragement." Had you any cases of that kind?—I have mentioned the case of a man who reclaimed a large area and started irrigation. His name is Ambaram Panja.

31. Q. What is the Nal Lake in Viramgaum?—It is a salt lake.

32. Q. (*Mr. Ibbetson*).—Do the people collect salt from it?—No.

33. Q. (*The President*).—Is it a large lake?—Yes; it is a natural depression, ten miles long.

34. Q. You say six acres is the average area commanded by a well?—Yes, I think so.

35. Q. The six acres could be irrigated at the same time?—I think so.

36. Q. (*Mr. Muir-Mackenzie*).—How many kos?—An average well usually has two kos.

37. Q. Not more than three acres to each kos?—No, I think not.

38. Q. (*The President*).—In your second paragraph you say "In the famine of 1899-1900 grants were made in each district for improving village water-supply. In my charge (Parantij and Modasa) these were used to deepen a good many village drinking wells, which had run quite or almost dry, with successful results." How are the wells deepened?—Men were sent down to clear out the accumulations.

39. Q. (*Mr. Ibbetson*).—They did not sink them deeper?—I do not think so.

40. Q. They only cleared them?—Yes; and perhaps they dug them deeper.

41. Q. (*The President*).—What do you think is the best form of protection for a district such as Ahmadabad against the encroachment of another famine?—I agree with Mr. Mehta's idea that irrigational surveys should be made and tanks constructed on favourable sites, but wells hold water longer.

42. Q. You don't know the Khari scheme?—I don't know it, but I know the country through which the Khari Canal goes.

43. Q. (*Mr. Higham*).—You say in your note, "these three bodies excavate silted up tanks as they can, with the help of village contributions which are asked for as a condition of repair wherever possible." Are the villagers supposed to contribute to the clearance of their tanks?—Preference is given to the villagers who do make such contributions.

44. Q. Is there any rule about it?—I think there is a Local Board rule and a Government Resolution.

45. Q. Local Boards only clear out tanks which are used for drinking?—Yes.

46. Q. They do not clear out irrigation tanks?—Possibly they do clear some of the small tanks used for irrigation.

47. Q. If any revenue is earned on a tank, it would not be cleared by the Local Boards?—As a rule, such tanks would be called Public Works Department tanks.

48. Q. And these Public Works Department tanks the Public Works Department don't take in hand unless the villagers are ready to contribute?—I think they generally wait for that.

49. Q. They give preference to those who contribute?—Yes.

50. Q. Did the Public Works Department dig out tanks to any large extent before the famine of 1899?—No.

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51. Q. It was deferred for want of money and want of Budget sanction?—The reason was that the people did not or would not contribute their share.

52. Q. What share?—I do not know exactly.

53. Q. You say the villagers ask to be allowed to repair the tanks, but they want to be paid for their labour?—Yes; since the famine.

54. Q. They want to get money?—Yes, and they like to get labour in their own villages.

55. Q. I do not quite understand what you mean by assessment of sub-soil water?—In the Revenue Settlement in certain talukas instead of charging anything extra on account of wells the land is charged according to the amount of water supposed to exist under the sub-soil whether there is a well or not.

56. Q. How do you measure the quantity of water under the sub-soil?—Trial borings are made, and it is generally known where water can be obtained.

57. Q. (Mr. Ibbetson).—You say takavi cannot be given without making inquiries as to the security. Why should that be necessary when you have the land?—You cannot be sure that the land is not already encumbered.

58. Q. Is not the Government loan a first charge on the land?—Yes.

59. Q. Then the encumbrance does not matter?—No. I suppose not.

60. Q. Is not delay a great factor in preventing people from applying for takavi?—I think delay tells a good deal.

61. Q. I notice that some of the witnesses say that inquiries have to be made as to the man's solvency?—Yes.

62. Q. Is that true?—Yes; sometimes his land is worthless.

63. Q. There must be many parts of the country where you know that the land is a sufficient security without any inquiries?—If you do not happen to be on the spot, you must make inquiries as to the man's solvency.

64. Q. Speaking of making people repair their tanks you quite agree with Mr. Mehta that it would be hopeless to get them to dig tanks? You say "villagers are constantly asking for their tanks to be dug out because they get paid for their labour"?—Yes.

65. Q. Mr. Mehta said they would expect Government to clear them for them and so let the tanks go absolutely into disrepair?—I believe there is much truth in that.

66. Q. Do you know why the villagers are made liable for 10 per cent. of contribution when they are already assessed for the water they get from the tanks?—I do not know.

67. Q. If they do not pay the 10 per cent., they do not get their work done?—I do not know.

68. Q. You do not suppose, at any rate, that the work is done for them if the 10 per cent. has not been paid?—I think the Public Works Department try to get the 10 per cent.

69. Q. You say you do not think that fear of future enhancement would prevent men extending irrigation now that there is a sub-soil assessment. I do not quite understand you?—I think I made a mistake there.

70. Q. You say again that "assessment of sub-soil water, if properly effected, is a sufficient inducement to irrigation as far as taration is concerned." How is there inducement to irrigate?—If a man uses sub-soil water below his well, he gets the advantage without having to pay anything more.

71. Q. He has got to pay the assessment whether he makes a well or not?—Yes.

72. Q. I suppose you do not know anything about the way in which these things are actually worked?—No.

73. Q. You have no practical experience?—No.

74. Q. Are there any rules under which a Collector can abstain from recovering all the instalments of takavi in a bad year. Supposing a well goes wrong or crops fail?—As far as I know the rules, the Collector has power to suspend recovery of instalments in times of famine.

75. Q. Do you know of any rule which empowers the Collector to do so except in times of famine?—I do not remember any.

76. Q. Have you powers to moderate the rigidity of recovery?—I have had petitions to abstain from recover-

ing instalments and I think they have been accepted. I remember some instances in which this was done.

77. Q. You say you would remit the interest on advances for wells?—I think so, if Government has no objection.

78. Q. Government has to borrow the money and it will have to bear the loss if it remits?—It does not borrow.

79. Q. It borrows enormous sums every day. Do you think it would be worth Government's while, as a protective measure, to give takavi in Ahmadabad and Broach free of interest?—I do not think so. [I think so now, for wells. (May 1902.)]

80. Q. Would the result be worth the loss of money?—No. I do not think it would. [I now think it would. (May 1902.)]

81. Q. You say that remission of advances in case of wells will be a temptation to dishonest cultivators. Why is that?—It would be a sort of gamble at the Government expense.

82. Q. They would become more speculative?—Yes.

83. Q. Suppose Government only remitted its advance in cases where wells have gone wrong; do you think any provision of that sort would remove your objection to the remission of takavi?—I think then there would be no objection.

84. Q. You say "I found people in Sanand and Dholka constantly asking to have their irrigation tanks mended and also to have large sloping areas of surface water held up by long bunds," these 'bunds' could be easily made by themselves?—Yes; they would have to combine.

85. Q. Would it be quite impossible or hopeless as far as you know to get people to combine for work of that sort?—I don't think they will work without being paid.

86. Q. Do they make small tanks?—They do make them within their own fields.

87. Q. Anything that would irrigate 200 acres?—I do not remember any so large as that.

88. Q. Do you think they could be induced to build tanks by grants-in-aid?—No.

89. Q. Would it not be possible for Local Boards to dig tanks and keep them in repair?—I don't think they can ever do more than one or two a year.

90. Q. That is for want of funds?—Yes.

91. Q. You say "the cultivator is responsible for these tanks, make him an allotment and get him to do the work;" suppose the Local Boards were made an allotment, do you think the work would be done?—I think so.

92. Q. Do the Local Boards keep up drinking tanks?—Yes.

93. Q. There is no reason why the Local Boards should not manage a very great number of small tanks?—No.

94. Q. Do you see any objection to that?—I think they do it at present.

95. Q. If a man makes a tank and spends money on it Government puts an extra assessment on the land; suppose the Local Boards were to make these tanks, would it be reasonable for Government to give them a portion of the enhanced assessment?—Yes.

96. Q. Government could do the big works and allow the Local Boards to attend to the small works?—Yes, I think so.

97. Q. Your experience of Local Boards is that something of the kind may be done?—Yes; in good years the tanks would make a good return, in bad years they would lose nothing. The distinctions between the Local Board tanks and the Public Works Department tanks are arbitrary.

98. Q. You say "a well in a drought will supply the deficiencies of the rain harvest," and you say also that wells fail in their supply?—I do not see how you reconcile the two things; do wells generally fail in drought?—Not the best wells.

99. Q. Generally the wells were of great assistance during the famine?—Yes.

100. Q. (Mr. Rajaratna Mdlr.)—Could you tell us what are first and what second class works?—I am afraid I do not know.

101. Q. Do you think it fair to call upon the cultivators to contribute 10 per cent. of the cost of repairs, more especially considering that the assessment is not remitted even in seasons of drought?—It does not seem fair.

102. Q. In case a tank is constructed by a private individual you remit the entire water rate and charge him only *jarayet* rate?—I think so.

103. Q. Land irrigated under the tank is not liable under the present rules to pay any water advantage rate?—I think there is a special contract made in that case.

104. Q. I think what you mean by sub-soil assessment is assessment on land according to the depth of water?—No, according to the water facilities.

105. Q. Suppose one well is dug by the rayat and water is found at 20 feet depth and another at 40 feet depth, what would be the sub-soil rate?—The sub-soil rate would be fixed before the well was dug.

106. Q. And after the well is dug?—The rate remains the same.

107. Q. Then what is the meaning of calling it a sub-soil rate?—Formerly the rate used to be charged on wells; but now the well is not considered at all and simply the property in the land is considered whether it is suitable for a well or not.

108. Q. What is a riverside pump?—A steam pump.

109. Q. Has it been successful?—I think it is a great success.

110. Q. What is the cost per acre irrigated?—I do not know.

111. Q. Do you know what is the cost of boring tools?—I am afraid I do not know.

112. Q. Are rayats willing to take loans for these boring tools?—It has only just been tried, and I do not know the result.

113. Q. Do you think they pay for the services of men employed?—I do not think they have men at present.

114. Q. In paragraph 39 you say "for any good reason land might be temporarily attached." Under what condition would you attach the land?—For arrears of revenue.

115. Q. You say "the insufficient supply of manure is without doubt the main obstacle to irrigation." Do the rayats use green leaves from the forests around for purposes of manure?—I have never heard of it.

116. Q. Who measures the land irrigated under the canals and other irrigation works in the Ahmadabad district, is it done by the Public Works Department or the Irrigation Department?—I don't know.

117. Q. (Mr. Muir-Mackenzie).—Do you think that were advances made to a villager or to a number of people on their joint responsibility for the construction of tanks they would be able to make small tanks, irrigating say 20 to 30 acres?—I think they might.

118. Q. You have never had such applications?—No, not for new tanks.

119. Q. Have you cleared old tanks?—Very constantly. *Mr. A. F. L. Emanuel.*

120. Q. Are you aware that the sub-soil water is determined with reference to the sub-soil water level?—I think it is also determined with reference to the quality of water. *3 Dec. 01.*

121. Q. The water level is one of the points?—Yes.

122. Q. Suppose a village is surveyed regarding the water level and sweetness of the water and the saline characteristics of the soil, would you have the data necessary to determine whether it is advisable to sink a well?—Yes, I think so.

123. Q. What kind of works do you propose to start for famine labour—wells or tanks?—I think it depends upon the locality.

124. Q. Are there any localities in your charge which require tanks?—Very few.

125. Q. Do you mean that very few places have been found where new tanks could be made for rice cultivation?—I would not like to say that.

126. Q. You never got applications from people for these tanks?—Never.

127. Q. And for long *bunds*—have you ever had applications for these?—Yes, I have in regard to those.

128. Q. They make a very good form of relief work?—Yes; better than roads, but I do not think that in many parts of the district they could make *bunds*; they could be made only in one corner.

129. Q. They would be a useful form of relief work?—Yes, I think so.

130. Q. Are you in favour of granting large advances when famine threatens, for digging *kachcha* wells?—Yes; the people have been taught a severe lesson by the last famine.

131. Q. Do you think these wells were a success?—They were very useful.

132. Q. Probably for fodder?—And also for grain crops; the sub-soil water is very high.

133. Q. (Mr. Ibbetson).—Of what district are you speaking?—The Parantij taluka of this district.

134. Q. Is that your charge?—I was there during the famine.

135. Q. Then you have specific knowledge?—Yes happen to know the place well.

136. Q. There, these wells are used?—Yes, because the water is so high.

137. Q. (Mr. Muir-Mackenzie).—If it is ascertained beforehand whether the water level is very high, it would be advisable in famine times to at once place large sums at the disposal of the people and give advances for digging *kachcha* wells?—I do not think there would be many other areas suitable for *kachcha* wells.

SIXTEENTH DAY.

Ahmadabad, 4th December 1901.

WITNESS No. 15, MR. F. G. PRATT, I.C.S., Collector of Ahmadabad.

Answers to printed questions.

I.

GUJARAT.

1. Ahmadabad District.—

	Acres.
Gross area	2,192,130
Culturable area	1,723,866
The proportion of the culturable area protected by Government Irrigation Works	01
The proportion of the culturable area protected by wells	02
The proportion of the culturable area protected by private or village works	03

2. Character of the soil.—There are two main varieties of soil: 'goradu' and black cotton soil. The

commonest soil is the *goradu* or sandy light coloured alluvial soil. This varies extremely in fertility, principally from the presence of sand in greater or less proportion, from being capable of producing only scanty crops of the commonest cereals to a degree of productive power probably unsurpassed by soil in any part of India. It differs from the *kali* or black cotton soil especially in its power of retaining moisture being far inferior, and thus almost all the crops which are raised in it without artificial irrigation are *kharif* and reaped immediately after the monsoon. It requires also frequent and copious manuring to prevent its productive power from being exhausted.

Black cotton soil is also found over large areas of the district and grows cotton and wheat. It is intrinsically more valuable than *goradu* soil, as it recruits its own strength with merely the aid of rain and atmospheric air: it does not stand in need of regular manuring and is much more retentive of moisture.

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3. Ordinarily there is but little demand for water in Gujarat during the south-west monsoon. But one exception to this general statement must be made in the case of the rice lands. It is obvious that rice cultivation with an average rainfall of about 30 inches must be at all times more or less precarious and speculative. If the distribution of the rainfall is at all irregular, the crop must suffer unless assisted by artificial irrigation, and the frequently recurring failures of the later monsoon rains in September are a frequent cause of the failure of the crop.

4. *Ahmadabad District*.—Total area irrigated by wells—

(a) In ordinary years 44,100 acres. This is the average of the four years (1895-96 to 1898-99).

(b) In years of drought (1899-1900)—92,445 acres.

Number of new wells constructed annually during the last five years is as follows:—

	Rs.
1896-1897.	55
1897-1898.	65
1898-1899.	63
1899-1900.	1,915
1900-1901.	512
TOTAL	2,610

But those figures cannot be accepted as reliable or authoritative as they have been collected in a hurry from the various talukas of the district, and it is doubtful if the figures of *kachcha* wells have been given in all cases.

5. The extent to which construction of wells has been assisted in the Ahmadabad District by advances from Government is shown in the sub-joined table:—

	Amount of Advance. Rs.
1890-1891.	7,775
1891-1892.	3,460
1892-1893.	850
1893-1894.	275
1894-1895.	4,575
1895-1896.	9,205
1896-1897.	3,005
1897-1898.	2,110
1898-1899.	1,635
1899-1900.	1,41,305

In recent years the concession has been made to well-constructors of a guarantee against any increase of assessment on account of the improvement of the land effected by the construction of the well.

II.

A.—General.

1. The answers below written are based upon my experience of the Kaira District and of portions of the Ahmadabad District.

2. The average rainfall in the Ahmadabad District in the years from 1870 to 1878 was 32·13 inches. "The rainy season generally begins in the latter part of June, expends its greatest strength in July and gradually loses force till its close about the end of September" (*Ahmadabad Gazetteer*). I am unable to give monthly averages, but rain at any time except the four months' (June—September) period is rare and not to be counted on.

3. I know of no obstacles to the extension of irrigation arising from any of the causes classified under heads (1), (4), (7), (8) or (9).

Head No. 2.—In the districts of Gujarat owing to the large destruction by famine of agricultural cattle it is possible that this obstacle may prevent any great extension of well-irrigation: but at the same time I think that few of the useful well-cattle were allowed by their owners to perish, and the cattle that died are being replaced year after year by private enterprise and by the help of Government takavi advances.

The insufficient supply of manure (*head No. 3*) is without doubt the main obstacle to the extension of irrigation: and this is the reason which is most commonly assigned by the people themselves. The surplus of manure is only

sufficient for a limited area in the home fields near the village site. These home fields are naturally the first to be irrigated, because they are the most accessible for labour and supervision, besides being probably of a better quality of soil originally. Lack of capital for the initial expenditure (*head No. 6*) doubtless operates to some extent to prevent the extension of irrigation. Thus a cultivator of one of the backward classes, e.g., a Koli or Dharla, would not find it easy to find the capital for sinking a well or the funds for carrying on the culture of irrigated crops. But lack of enterprise would in most cases prevent among such classes even the desire for improved cultivation, for in a normal season the cultivator would without irrigation raise a crop which would amply suffice for his maintenance.

4. Land which is irrigated from wells or other works constructed by private capital is permanently exempted from enhancement of assessment on account of the irrigation. Thus land, which during a term of survey settlement may have been converted from dry crop land to garden land would on the introduction of a revision survey continue to pay the dry crop rate. I consider that the existing provisions in this respect are sufficiently liberal.

5. Loans under the Land Improvement Act are now being taken freely in Gujarat; their popularity has enormously increased owing to the famine and the scarcity of the last two seasons.

I see no reason for recommending—

- (1) reduction of the rate of interest; or
- (2) remission of the interest; or
- (3) partial remission of the advance; or
- (5) extension of the period for repayment; or
- (6) grants-in-aid.

I would recommend, in the case of failure of the attempt to obtain water, total remission of the amount ascertained to have been actually expended. I am of opinion that the existing conditions under which such loans are made are quite liberal enough, and I fully endorse the views of previous witnesses which I have seen quoted in the press to the effect that the success in the administration of the Act depends upon men, not measures.

6. I cannot answer the first half of this question. No such case has ever come to my notice. In a portion of this district, viz., the South Daskroi tract and the adjacent Daskroi tract of the Kaira District, where rice is the principal crop, there is a strong desire that this crop should be secured by a supply of canal water in the latter portion of the monsoon. The crop frequently fails altogether or is severely affected for want of rain at the end of the monsoon, and a canal supplying water in September would be an immense boon in such tracts. Complaints of the deficiency and suggestions as to the means of supplying it are frequently made by the cultivators themselves.

D.—Tanks.

23. (1) The tanks in the Ahmadabad and Kaira Districts are supplied with water by the monsoon rain and in the majority of cases have little or no catchment area. The number of tanks whose water can be made available for irrigation bears but a small proportion to the whole.

(2) The water is distributed to the land in a few cases by direct flow and in the great majority of cases by lift, the water being lifted by manual power or by bullocks from one pit to another up the incline until it has been brought above the level of the fields which it is intended to irrigate.

(3) I cannot answer with certainty on this point, having only known the Ahmadabad and Kaira Districts in seasons of drought or scanty rainfall: but I believe that even in normal seasons the tank water-supply is rarely available for rabi crops.

(4) The area irrigated varies with the size and nature of the tank. The maximum area irrigable would, I think, be perhaps 250 acres from an ordinary village tank: the average would perhaps be about 50 acres: but I am not at all sure of these figures.

24. (a) In a year of ample rainfall tank-irrigation would undoubtedly render it possible to cultivate two harvests instead of one; but little use of the tank water having been necessary for the kharif rice crop, the surplus would be available and would be used for rabi cultivation, wheat or barley or grain.

The supply in tanks being nearly always dependent on the monsoon and therefore being uncertain, it appears to me that tank-irrigation could not have the effect of leading

to a permanent substitution of a more valuable crop or variety, e.g., Kamod rice for Sutarsal rice (Kamod is about 25 per cent. more valuable).

(b) In a year of scanty rainfall, i.e., scanty towards the end of the monsoon, the value of irrigation tanks properly kept up may be estimated by a consideration of the following extracts from the revision Survey Blue Book of the Dholka Taluka of the Ahmadabad District. *

Captain Wingate, Revenue Survey Commissioner, wrote in 1853:—

"The rice lands are for the most part dependent on tanks which are quite dry in the hot weather, and unless the rains fall sufficiently in the early part of the monsoon to fill them and to enable the cultivators to sow the nursery beds from which the young rice plants are subsequently transplanted into the fields, rice crops cannot be raised at all. Ample falls of rain later in the season though sufficient to fill the tanks are of no avail, and as the early fall is very uncertain, it is quite a common occurrence for the entire rice lands of a village to be left waste, so common indeed as to be a characteristic feature of the agriculture of the district. In illustration of this I may mention that out of the seven villages experimentally settled by us last season the rice lands of two, Ranesar and Degamra, were left entirely uncultivated, though Degamra is one of the finest rice villages in the district. This evil is too aggravated by the customs obtaining among the cultivators. Unless a tank fills sufficiently to admit of the irrigation from it of the whole plot of rice land lying below it, the custom in some villages is to prevent the cultivation of rice on any part of it so as to avoid disputes about the right to the water."

And Mr. Rogers as Settlement Officer wrote in 1854:—

"I explained in a former report to the late Revenue Survey Commissioner that the rice-growing lands of the district were situated entirely under tanks or in low situations where water would lie in the monsoon: their value, therefore, entirely depends upon the supply of water they can calculate upon receiving upon an average year after year. Even, however, under the most favourable circumstances there occur in Gujarat such seasons of drought that these lands cannot be cropped with rice."

Further on in the same letter he writes:—

"Another great *sine qua non* for the development of the resources of the district is the improvement of its means of irrigation. Rice cultivation could be effectively maintained and improved by attention to the deepening and clearing out of tanks."

(c) In a year of drought no tank in Gujarat would be of any use for irrigation.

26. I have known the tank-supply to be eked out in seasons of scanty rainfall by well-irrigation.

30. So far as I know, there is no regular provision either on the part of the cultivators or on the part of Govern-

ment for the maintenance of tanks useful for irrigation. The people when left to themselves will allow even good tanks to fall into disrepair and ruin from want of co-operation and enterprise. Some of the larger irrigation tanks are occasionally repaired by the Public Works Department, but I do not think that systematic attention is devoted to them. The smaller tanks are left to themselves.

33. The silting up of tanks is a frequent source of complaint. The villagers do not combine to carry out clearance work themselves, but they are often willing with official assistance to raise subscriptions in the village for the execution of repairs by official agency.

Wells.

34. (2) The supply is liable to fail or to become much reduced in years of drought, such as those which Gujarat is now experiencing.

(3) The average cost of construction I would put at Rs. 350 or 400.

(5) The water is raised in water bags drawn by bullocks.

(6) The average area attached to and commanded by a well I would put at four acres if the crop exclusively depends on the well-water.

35. In a year of scanty rainfall a well is useful in two ways for rice:—

(1) When rains are late at the beginning of the season it enables the well-owner to prepare his rice nursery beds earlier than the man who has no well: and his rice thus can be transplanted earlier and get the benefit of the rains as soon as they fall.

(2) When rains are scanty at the end of the season it enables the well-owner to give his rice crop the last waterings which may make all the difference between a total failure and a normal crop.

38. (1) Yes.

In some cases wells are impossible in an entire village, because they are sure to be salt. In many cases it is impossible to know before digging that the water will not prove to be salt. A salt well may be met with 20 yards away from a sweet one.

(2) I have heard of cases where the attempt to construct a well has had to be abandoned owing to the soil being so sandy that the sides of the well fell in.

40. Temporary wells are commonly used in some parts of the Ahmadabad District, especially for rabi cultivation, in alluvial river side lands or in river beds. They are of great use especially, I think, for rearing fodder crops, and for this purpose were largely resorted to in the recent famine.

Their construction could be encouraged by liberal grants of takavi, as the cost of construction is trifling.

1. Q. You are Collector of this district?—Yes.

2. Q. How long have you been in here?—I came here in May 1899.

3. Q. From your printed memorandum it appears that you have been in Kaira too?—I was there from November to May. My connection with Gujarat begins with May 1899.

4. Q. Where were you before that?—Before that I was in the Deccan, in Sholapur and in Sindh.

5. Q. You were in Gujarat through the whole of the famine?—Yes.

6. Q. You say the culturable area of this district is 1,723,000 acres; about how much of that is cultivated?—I could not say without referring to the statistics.

7. Q. Are the people in the habit of leaving much land fallow?—I could not say; I only came here during the famine, and I think a great deal of land lies fallow on account of the famine.

8. Q. The amount of culturable area covered by Government works is a mere bagatelle?—Yes, a very insignificant proportion.

9. Q. (Mr. Muir-Mackenzie)—That does not include tank lands?—No; but I don't think that would increase the area by more than 1 or 2 per cent.

10. Q. (Mr. Muir-Mackenzie)—There are tanks for rice irrigation?—Yes; they are not included in my figures.

11. Q. (The President)—You say in your note that there has been a very great increase in the number of wells in the last five years; in 1896-97 there were 55 wells, and in 1900 there were 1,115 wells?—Yes.

12. Q. Takavi advances were given in the same proportion?—Yes.

13. Q. In 1899-1900 the takavi advances amounted to Rs. 1,41,000?—Yes, for land improvement.

14. Q. Not for seeds?—No; for land improvement; seeds and bullocks would not be included.

15. Q. What would be included?—Almost entirely wells.

16. Q. There was an enormous increase of wells?—Yes.

17. Q. Are temporary wells included?—Yes, they are.

18. Q. I suppose there is a large proportion of these temporary wells?—Yes; I could not say how many.

19. Q. They would not require much takavi advances, because *kachcha* wells cost so little?—Yes, the bulk of money would be for *pakka* wells.

20. Q. You say in paragraph 5 of your note that "you see no reason for recommending a reduction of the rate of

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interest or remission of interest." That is as regards loans for improvement?—They do not require any inducement. I don't think that the knowledge that the interest would be reduced or remitted would be a great inducement. What they require is a prompt disposal of their application and prompt receipt of money; they don't very much care what the rate of interest is.

21. Q. Can you suggest any procedure for the prompt disposal of their requests?—I do not think the system can be improved.

22. Q. How long does it take under ordinary circumstances to get actual payment?—There are considerable delays; a man may get the money in five months if he is fortunate; I think seven is a fair average.

23. Q. Could that not be improved?—No.

24. Q. The man can go to the *sowcar* and get his money at once over the counter?—Yes, if he has credit. There was so much delay recently as the amount of work was enormous, I do not think it would take so long in ordinary years.

25. Q. Do you give cheques?—No; that is not done here; the man can get the money from any Treasury.

26. Q. (Mr. Ibbetson)—Do you think inquiries about the rayats' solvency and encumbrances account for the delay in his getting the money? Supposing the inquiries were abandoned, would it make any difference?—Yes, certainly.

27. Q. A substantial difference?—Yes, undoubtedly; but none the less is the enquiry necessary.

28. Q. Why? seeing that the loan is the first charge on the land?—Because it might be that the man is not solvent, or that on getting his loan he is likely to misapply it and the amount might be irrecoverable.

29. Q. You always make the loan depend on the security?—Yes, that is the object to which our inquiries are directed. We examine the land he offers as security and ascertain the solvency of the man.

30. Q. But the loan is the first charge on the land?—Yes, by law; still we must make sure that the loan is given on sufficient security and therefore we have to make inquiries.

31. Q. Is it necessary to enquire into the solvency of the man and the encumbrances on his land if the loan is to be a first charge?—I think it is necessary; it is doubtful whether the land is not encumbered and whether the Government advance will not be in danger though it is the first charge.

32. Q. (The President)—You say in paragraph 6 "I have known the tank supply to be eked out in seasons of scanty rainfall by well irrigation." Is that systematically done on these smaller tanks which belong to villagers?—I think so, but I have not seen many cases of successful rice cultivation in Gujarat where I have had only famine experience.

33. Q. In paragraph 38 you say "In some cases wells are impossible in an entire village, because they are sure to be salt." Does that hold good in each of these districts of Ahmadabad?—Yes, in a great many of the villages.

34. Q. Are there any villages that have not got wells of some kind with drinking water?—Yes.

35. Q. How do they manage?—After the drinking supply has become absolutely unpotable they have to clear out.

36. Q. (The President)—Would you advocate the districts having at their disposal boring apparatus for the use of the villagers when they want it?—I do not know. I have found that the people are not able to work it. On the other hand, a boring apparatus in this district is worked by people of a particular class who have a special knowledge.

37. Q. Is that a drill for boring?—Yes; some simple contrivance.

38. Q. (Mr. Ibbetson)—Do you refer to deepening the bottom of the well?—Yes, to increase the supply.

39. Q. (The President)—Is it the custom before sinking a well to make experiments by boring?—No.

40. Q. With your knowledge of this district and of the terrible times through which it has passed, what do you consider would be the best measure that Govern-

ment can take to protect it from a like suffering in future?—The first measure I should take to relieve the most serious distress caused by entire and complete drought would be, if possible, to construct big canals, such as the Sabarmati. That would afford considerable relief.

41. Q. From what you know would you expect it to carry sufficient water during times of drought?—If there is a complete failure of rainfall, I am not sure it would; but if it is a partial failure, it would save a considerable area of rice. The next question is of making small irrigation tanks which, if kept in proper order, will be extremely valuable in irrigating considerable areas in years of partial drought.

42. Q. As a rule are these tanks in bad repair?—I think a great many of them are in disrepair.

43. Q. Do you know any instance of people trying to help themselves in the matter of repairing these tanks?—Yes; I know of an instance (I have read of it in the Revenue Settlement Report) where three villages combined and repaired their tank and they alone in the whole rice tract did not have to get remissions.

44. Q. (Mr. Ibbetson)—In what year was that?—About 1882.

45. Q. (The President)—From the lessons of the last three years would it not be natural to expect some similar action on the part of the villagers in times of drought?—I don't think they are likely to take the initiative themselves; it will have to be done by some superior authority. The people would quarrel; Government officers should take the matter in hand.

46. Q. What do you consider the most suitable form of relief work?—In this district, small irrigation tanks.

47. Q. The existing tanks are not, I think, repaired in large numbers?—Not very largely. In the big famine of 1899-1900, I think very few, if any, were repaired; I should prefer to spend all the money on these tanks rather than on other useless works. If tanks are repaired beforehand they would be very useful in times of drought.

48. Q. (Mr. Muir-Mackenzie)—Would there be no difficulty in the supervision of such works?—Not if the plans are carefully prepared beforehand in every detail. We did it to a certain extent in the Kaira district last year. I think the thing could be managed if we had every thing to a certain extent out and dry beforehand.

49. Q. (The President)—Have you got a relief programme for your district?—Yes; quite sufficient for our requirements, we do our best in pushing all our schemes, but there are a great many objections; each one of them requires a great amount of attention, and I have heard complaints about the Public Works Department subordinates not having sufficient organization.

50. Q. What would you do chiefly?—Dig up silt and repair bunds.

51. Q. (Mr. Higham)—Have you considered the Sabarmati scheme?—I have read it through; it is an excellent scheme so far as I understand it.

52. Q. Is it on the right bank of the river?—Yes.

53. Q. Is there any scheme on the left bank?—On the left bank we have the Khari scheme that waters rice lands.

54. Q. Suppose the canal is taken higher up the river, would it affect another part of the district?—I think not; north of Sanand is the Gackwar's territory.

55. Q. (Mr. Ibbetson)—You say that the best use to which relief labour could be put is the clearing of the existing tanks?—Yes.

56. Q. Would you extend them?—Yes, if possible.

57. Q. Do you know how far it is possible?—Certainly, it is possible to some extent, because in the Khari river some excellent new sites have been discovered.

58. Q. Do you think they might be expected to bring Government a reasonable return?—I could not express an opinion without seeing the figures.

59. Q. You say in paragraph 3, "it is obvious that rice cultivation with an average rainfall of about 30 inches must be at all times more or less precarious and speculative. Do you refer to a whole cycle of bad years, or are you speaking of normal years?—In normal years also it has always been so.

60. Q. The tanks may be expected to reduce the risk?—Three years out of five certainly; last year there was

a rice crop under tanks; there was no other rice reaped in the district.

61. Q. You say, "the area irrigated from wells is more than doubled in a year of drought." Is that mainly owing to *kachcha* wells made on account of the drought, or is it due to wells that were ordinarily disused being brought into use?—Both causes contributed, I think.

62. Q. Do you know the number of wells that are not ordinarily used?—I think a considerable proportion are not used.

63. Q. You say that an "insufficient supply of manure is one of the main obstacles to the extension of irrigation." Do you know from your own experience, or from what people told you that irrigation does harm if the land is not sufficiently manured?—It is a very common statement.

64. Q. You have no personal knowledge on the subject?—No.

65. Q. (*Mr. Rajaratna Mdlr.*)—Do you know of a petition to the Government of Bombay from the people of Dholka, suggesting that an irrigation canal should be constructed?—I heard talk about it the other day.

66. Q. Is the project under investigation?—Yes.

67. Q. In paragraph 4 you say "the area irrigated is 92,000 acres;" is that more than double the area ordinarily irrigated?—A great deal of that was for fodder crops.

68. Q. Do you mean that more than double the area was irrigated?—Yes, quite so.

69. Q. How do you account for that?—By an increase in the area and an enormous extension of fodder crops, which require less water.

70. Q. (*Mr. Ibbetson*)—A good many new wells were made?—Yes.

71. Q. (*Mr. Rajaratna Mdlr.*)—You refer to the insufficient supply of manure as being the main obstacle to the extension of irrigation. Are green leaves used for manure in this Presidency?—I have never heard of it.

72. Q. In paragraph 4 you say "land which during a term of survey settlement may have been converted from dry crop land to garden land would on introduction of a revision survey continue to pay the dry crop rate?"—Yes.

73. Q. One witness told us yesterday, that it is likely to be charged on account of sub-soil advantage?—It is always liable to that whether it is dry crop or garden crop under the existing law; any land which has sub-soil facilities, whether they are utilized or not, is liable.

74. Q. Does the fact of sub-soil under wells affect the question of increased assessment?—It does not.

75. Q. Not even at the next Revision of Settlement?—No.

76. Q. Suppose a man digs a well now, will he not be liable at the next revision to pay an increased assessment on account of the sub-soil advantage?—No.

77. Q. You say "the success in the administration of the act depends upon men, not measures." Would it not be advisable to employ special officers to distribute loans?—Yes, on extraordinary occasions; not in ordinary times.

78. Q. If on extraordinary occasions a Deputy Collector could be appointed to distribute loans on the spot, would that tend to expedite matters?—Yes, that would, certainly.

79. Q. (*Mr. Muir-Mackenzie*)—A special officer is actually employed?—Yes.

80. Q. (*Mr. Rajaratna Mdlr.*)—Who collects the canal revenue?—The village officers.

81. Q. If the village officers do the work is any debit made on account of collection charges?—I could not say; I do not know.

82. Q. I suppose a village cess is charged in this Presidency? (*Mr. Muir-Mackenzie* replied that, except in Sind, no cess was levied in the Bombay Presidency on account of village establishment which was paid out of the Provincial revenue.)

83. Q. How many irrigation tanks are there in the Ahmadabad District?—I do not know, there must be many hundreds; probably 400 or 500.

84. Q. (*Mr. Muir-Mackenzie*)—Not something like 1,000?—There may be.

85. Q. (*Mr. Rajaratna Mdlr.*)—Does not your Administration Report tell you that?—No.

86. Q. I do not understand the difference between rice tanks and field tanks? *Mr. Muir-Mackenzie*—They were separately treated before the survey was made; we have no separate headings now.

87. Q. Mr. Beale recommends the construction of field tanks, and for that purpose he also recommends a survey. Are there any field tanks?—Yes, there are.

88. Q. (*Mr. Muir-Mackenzie*)—Have you had any practical experience of these *bandhs*?—Yes.

89. Q. Would they be a suitable work for famine relief?—Yes; very suitable because of their simple construction; very little technical knowledge is required, any man who has some experience can manage such works.

90. Q. You say that tanks could not be constructed without a considerable amount of technical knowledge and experience?—I think so; I should be very sorry to trust it to Local Fund Overseers; they have very little experience of irrigation; practically none.

91. Q. You would prefer that the work be done by Government?—I would prefer that the scheme be prepared by the Public Works Department; the Local Boards would then be competent to carry it out.

92. Q. Would you make the revenue available to the Local Boards?—That could be done; I have not considered the subject, but I see no objection to it.

93. Q. The Board's revenues are very inelastic?—Very.

94. Q. They depend entirely on the Land Revenue which cannot change for thirty years?—Yes.

95. Q. An additional source of income would be a great help?—Yes.

96. Q. Have you any experience of the water-logged areas?—No.

97. Q. Have you heard complaints regarding these drains?—I have heard complaints that the drains were not sufficient to carry off the water.

98. Q. Were you able to form any judgment of the area for which the drains were sufficient?—The drains had not done their work; they were utterly incomplete, and only half finished.

99. Q. If completed, would they have been valuable?—Yes, in years of heavy rainfall.

100. Q. In years of ordinary rainfall?—They are liable to be flooded.

101. Q. Do you believe that in years of ordinary rainfall such drains might be extended?—I do not know how; I have very little experience of water-logged areas; I have seen very few.

102. Q. (*The President*)—Have you reason to believe that if they are disused, the mischief will go on increasing?—No, I read that in old times very serious damage was done by flood.

103. Q. (*Mr. Muir-Mackenzie*)—You have not heard complaints that the drains damaged the adjoining lands by carrying away surface soil?—No.

104. Q. Do you think that for the construction of wells the people would prefer that Government should pay the cost of the well and charge additional assessment instead of charging interest and taking back the principal?—The permanent assessment would be most unpopular; anything in the nature of a permanent enhancement would be so. He would sooner borrow the money and make the well himself.

105. Q. Do you advocate a considerable extension of the period of instalment?—I think 20 years are sufficient.

106. Q. (*Mr. Ibbetson*)—What is the period in ordinary practice?—Ten years.

107. Q. (*Mr. Muir-Mackenzie*) Do you think a longer period for repayment would be better?—Certainly.

108. Q. The rayat would like to pay it in 50 years?—That is perhaps going a little too far.

109. Q. Do you think the people would like that?—I think they would.

110. Q. Would that not be practically a permanent assessment?—Yes.

111. Q. Your idea is that the people would prefer to have the period of repayment extended from 10 to 20 years to having 50 years or an indefinite period. Suppose we remitted the money and charged wet assessment?—I think a permanent assessment would be a great drawback.

112. Q. (*The President*)—Would it lower the value of the land?—Yes; I think that the man would prefer to raise the money himself, I am sure he would prefer the

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repayments in good years, he would probably pay larger instalments and get rid of the debt sooner; anything meaning enhanced assessment would create mistrust.

113. Q. (Mr. Muir-Mackenzie)—You would prefer not to see the experiment tried?—I think not.

114. Q. We have been told that the extension of wells is limited by the manurial supply?—Yes.

115. Q. Possibly you can get over that difficulty by giving a man an advance for wells and also for additional cattle at the same time?—They would not increase the stock of cattle for the sake of manuring their land.

116. Q. A man might buy cattle or he might buy manure with the advance given for manure?—They do not do that to my knowledge.

117. Q. Is there no chance of getting night soil used. It is used in Ahmadabad?—I think that could be done.

118. Q. (Mr. Ibbetson)—You say that anything in the way of a permanent assessment would create mistrust?—Yes.

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Kirparam.

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WITNESS NO. 16.—MR. BHIMBHAI KIRPARAM, Talukdari Settlement Officer, Gujarat.

Memo. by Witness.

I.—Character of the Soil.

Gujarat soils are of three chief kinds:—

(a) *Kali* or cotton soil, a black loamy clay characteristic of the Tapti and Nerbudda watered Broach and Surat districts; sweet alluvial plains.

(b) *Gorat*.—A light fawn-coloured sandy loam characteristic of the Mahi and Sabarmati valleys in the Kaira, South Ahmadabad, and Panch Mahals Districts; presents the highest type of cultivation in Gujarat (in the tract called Charotar about Nadiad).

(c) *Goranti*.—A reddish loamy clay, peculiar to parts below the Western Ghats and to the Gogha and Modasa hills.

Peculiarities of locality and climate divide *kali* and *gorat*, each into six varieties, which account for the varying fertility of different parts of Gujarat.

Kali or black soil has six varieties:—

(a) *Kali* or *regar*.—Pure black, argillaceous loam; free from stones or pebbles; abounding in carbonates of lime and magnesia—a long enduring and fertile soil—Broach plain.

(b) *Kali Khokhar*.—Greyish black, argillaceous, resting on *kankar*, intermixed with nodules; easily affected by changes of weather, becoming either very wet and stiff or very hard and fissured; suitable for wheat, *juari*, and rice.

(c) *Kali-bara*.—Snuff-coloured and friable; containing chloride of sodium, or carbonate of soda when deep; not unsuitable for cotton, but more adapted for wheat.

(d) *Kali Besar*.—Dark brown; near trappean rocks with small disintegrated pebbles; with more of peroxide of iron than *kali regar*, but less of magnesia and lime; much coarser in texture; valuable black cotton soil for garden cultivation; better for superior rice than *kali regar*.

(e) *Kali-Matodi*.—Sedimentary; colour from grey to black; collects in rice beds and low-lying tanks; highly valued as top-dressing for light red garden soils.

Kayarda or *kyari*.—Not exactly soil, but the prepared bed in which rice is raised with or without irrigation; colour black or red; valuable, according as retaining water to end of rice season.

These varieties of black soil are wet and heavy in rains; but dry, hard, and fissured soon after; discretion and experience needed in working them advantageously. Superficially retentive; they contain springs at great depth, often with brackish water, unfit for irrigation; bad for hedges and trees, and not fit for perennial cultivation. But irrigation and careful husbandry have made even these soils capable of high cultivation.

Gorat soil varieties have characteristics opposed to *kali* soils.

The six varieties are—

(a) *Goradu proper*, composed of disintegrated particles of sandstone, limestone, and secondary rocks; called *retal*, *pana*, *mor-pana* when incohesive; and *mardi*, when much mixed with nodular *kankar*: colour varying from light fawn to rich brown; and texture ranging from mere drift-sand to

119. Q. We have been told by several witnesses that people do not feel quite sure that if they make wells there will be no enhancement of assessment?—I do not think there is any such feeling.

120. Q. If the assessment is raised, you could tell the occupants that it is not on account of private improvements?—Only very few would understand the grounds on which the assessment was raised.

121. Q. You do not think there is any feeling that the private improvements are assessed?—I do not think so and have never heard that such a feeling exists.

122. Q. (Mr. Muir-Mackenzie).—If a tank is made people do not object to increased assessment on their lands because they obtain water; why should they object in this case?—I think the cases are different. Tanks and irrigation canals are not quite analogous to wells.

123. Q. They are both made by Government?—I think the wells are much more in the nature of private property.

loam; contains lime and so not barren, but very fertile; if not separated from an earthy sub-soil called *goranti*, capable of great improvement under irrigation and proper tillage; shows superior cultivation in manured fields near towns and villages; best adapted for dry-crop cereals, with irrigation produces varieties of vegetables.

(b) *Goradu besar* is *goradu* proper, but loamy, full of fruitifying properties of black and light soils combined; its silicious and calcareous components are reduced to fine mould by moisture and weathering, and decayed matter from trees, hedges, and artificially. Trees, bushes, and potash loving plants grow in it readily and vigorously; possesses alkali and therefore, specially valuable for tobacco, and the triennial variety of cotton.

(c) *Gorat-marva*, found chiefly near banks, or in deserted beds of rivers; shows a micaceous scintillation; free from pebbles; varying in colour from light brown to chocolate; very absorbent yet retentive; not hard even when dry, nor muddy when wet; rich in organic matter; generally found of uniform texture and quality to a great depth; has sweet water, found a few feet below surface, and it is therefore called natural *bagayat* or garden land, whether irrigated or not. Without any following, all the most valuable crops are raised upon it in rapid succession.

(d) *Rakhdi-ratu*, also called *puran* and *gabhan*, is the soil of old village sites, rich in nitrate of potash, though poor in appearance; it yields rich crops of grain, especially tobacco, the latter mostly without irrigation.

(e) *Gorat*, being the red and yellow clays of Pardi in Surat and Gogha in Ahmadabad; of laterite and limestone formation like the Konkan soil; in lower levels, it passes into the *kali khokhar* variety, and is best suited for rice cultivation.

(f) *Bhatha* or alluvial, is a fine micaceous chocolate-coloured loam annually deposited in the loops of rivers and islets, charged with the fertile ingredients of distant uplands and villages; its best quality is free from sand, and possesses richer and lighter particles in solution; thus it is naturally fertilized, easily cultivated, and in its deep moist bed it readily matures without irrigation most valuable garden produce.

All these red varieties are best for general cultivation; contain springs at no great depth; give better return on capital than black soils, show perennial verdure, with plenty of trees, hedges, and universal cultivation.

Besides *kali*, *gorat*, and *besar*, there are, of peculiar soils, along the Surat coast, the marshy lands called *khar* and *khajan*; and in the Pardi sub-division the soil is more like that of the Konkan than of Gujarat. Kaira has near Matar, salt or *khar* land; in Kapadvanj and Thasra, waste and ill-drained *mal* or upland, also found in Godhra; and near the Mahi, a coarse, shallow and dry soil called *mardi*.

Throughout Gujarat, the light alluvial and rich *gorat* soil is superior to the *kali* or black soil.

As compared with other districts, Surat is conspicuous for the large proportion which its fertile soils bear to intrinsically poor soils.

Of the entire culturable area of Surat, $\frac{2}{5}$ th is black, $\frac{2}{5}$ th is light and $\frac{1}{5}$ th is medium, or *besar* soil.

In Broach $\frac{1}{2}$ th is black, with crops of rice, cotton, wheat millet and *juari*. Of the remaining $\frac{1}{2}$ th of *gorat* or light soil, $\frac{1}{2}$ th yields cereals, pulses, and garden stuffs; and $\frac{1}{2}$ th is the rich alluvial *bhattha* in which all crops, especially tobacco and castor-oil plants, are raised.

In Kaira, the light or *gorat* prevails, varying from loose fawned yellow sand in fields near the Sabarmati and Mahi to rich light brown mould in Central Kaira, and attaining perfection in Matar. *Besar* soil, varying from heavy sands to light clays is pretty generally distributed in small tracts over the whole district. The black soil is poor, scarcely ever deep, and most of it mixed either with soda or limestone. Alluvial *bhattha*, chiefly found near the Vatrak, yields every year without dressing or fallow rich crops of tobacco, safflower, and other garden produce.

In the Panch Mahals *bhattha*, *mal goradu besar*, and *kali* are all found in different parts. The *besar* is well suited to rice, *kodra* and coarser grains. Kalol has much of *goradu*. In South Halol are stretches of rich black soil. Except stony hill ridges and patches of shallow gritty and red and dry black, the soil of the eastern talukas of Dohat and Jhalod, both light and black, is perhaps, from the abundance of underground stream water, of very high quality. The light varying from fawn to reddish brown, yields two, and, if watered, three, crops a year.

In Ahmadabad black soil is found chiefly towards the west and light in the east. But in many parts both occur within the limits of the same village. The black soil is much impregnated with alkali or *khar*. The light soils are well supplied with springs which enable the rayat, at very little cost, to have *rabi* or winter, and *khar* or summer, crops after the *kharif* harvest. Dhandhuka and Dholka have low *bara* lands, too moist for cotton, but suitable for rich wheat after rains subside. The *bhattha* soil about the Sabarmati is most fertile. To the north-east of Parantij is a red stony soil favourable for Indian-corn. In the high parts of Gogha and Ranpur it accumulates in a rich loam that yields good crops of sugarcane.

II.—Irrigation.

Irrigation in Gujarat is from tanks rivers and wells. According to the method of lift and delivery, it is called (1) *Patasthal*, (2) *Mothsthal* or (3) *Dhekudiat*.

(1) *Patasthal* is by gravitation, as from canals and dams built to confine the water in a pool, until it goes sufficiently high to flood the tract meant to be irrigated as in *khari* villages, or fields below the tank level, from which it is received through a sluice gate, or more often, simply by cutting the embankments. If the water has to be raised only four or five feet, *jhils* are used. These are of three kinds: *supda*, *chorsan*, and lever. The first is a rough and ready process for utilizing temporary pools of rain-water. It consists of a shovel-shaped basket or *supda* attached to two ropes worked by two men swinging the water by a jerk to a few feet higher channel. The second consists of a wooden trough, two or three feet wide, and eight to ten feet long, or leather distended over a bamboo frame-work of the same size called *chorsan* or *jhilu* worked by a heavily weighted lever on a cross frame of poles. The snout of the trough resting on the higher channel, the body, to which a rope from the lever is attached, is pressed into the lower reservoir, and is assisted up for discharge by one or two men. In the third, a similar lever, working on a single pole like a yard and mast of a ship to which a bucket is attached, is used to raise water from shallow wells.

(2) *Mothsthal* for raising water from wells and rivers by leather bags called *ramio* or *sundhio kos*. Sometimes, the Persian wheel, called *rehent*, and the capetal barrel are used. The *ramio kos* is a whole bullock-hide, with cut corners, pursed with leather thongs to a stout iron ring fifteen to eighteen inches in diameter. It holds from four to six cubic feet of water. It is attached with a swivel chain to a stout cow-hide rope, and drawn over a wheel to a stout raw cow-hide rope and drawn over a wheel moving between two sloping props resting on a beam supported over the well by upright posts. It is drawn by a single pair of bullocks descending a slope, with the bucket rope attached to the *tarila* yoke. On the leather bag reaching the level of the discharging trough, it is bumped down and collapsed. A man on the trough gives a song signal when the bullocks are to start, and when the rope is to be detached from the yoke, which latter the driver does by pulling out a taggie or pin.

The *sundhio* differs from the *ramio* in having its snout sewn on to the bag, and an additional rope attached to the snout working on a roller at the base of the platform. Both

snout rope and lift, attached to the platform are so arranged that, on the bag reaching the level of the trough, it empties of itself. In the *ramio* the bullocks have to be detached from the bottom of the incline, turn round, and walk up to be re-attached. In the *sundhio* the bullocks are not detached and have to slowly back up the incline.

(3) *Dhekudi* is the common apparatus of a wheel, erected on the high perpendicular verge of a river bank and a single pair of bullocks draw up the *kos* either *ramio* or *sundhio* according to the depth of the water. The *dhekudi* can only be used where the stream is immediately beneath a perpendicular bank, or led there by connecting channels cut through the bed of the river.

Garden Cultivation.

The cultivated lands in Gujarat may be classed under three heads:—*Jarayot* or dry-crop land, *Dangar* or rice-land, and *Bagayat* or garden lands.

The proportion of irrigated to the unirrigated land is $\frac{1}{10}$ th; and of garden to dry-crop land is $\frac{1}{10}$ th. *Dangar* or rice-land comprises $\frac{1}{10}$ th of the total cultivated area; and irrigated to unirrigated rice-land is $\frac{1}{10}$ th.

For a province so fertile and with such resources as Gujarat, the above extent of irrigated land is very short. Under a proper system of irrigation its produce would be unlimited in variety and superior in quality and quantity. The value of irrigation is practically the difference between the production of the cereal staple and yield of the *malyat* or garden crops which give two to ten-fold more to the rayats capital thereon invested. The cultivation of these *malyat* crops, such as sugarcane, plantain, ginger, turmeric, and chillies depend very much on capital and the rayat's resources. Even with clear prospects of great profit, only the man with large capital is able to attempt it. Such cultivation is seldom possible for a single rayat, because ploughs, cattle, and labour are required to prepare the land and raise the water from wells. In such cases, three or four rayats have to combine and work such a profitable undertaking.

The scope of garden cultivation is large and deserves encouragement.

For purposes of irrigation it is not necessary that a tank should retain water during the whole year. It is enough if the pool covers a large surface, and is so situated that the land to be irrigated lies around and slightly below it. In the event of a scanty rainfall, the cultivator has recourse to his tank in September and October, and by watering them saves his early or *khari* crops. For the ordinary late or *rabi* crops, it is enough if the supply of water lasts through November and December. So that, except in the case of sugarcane, if the reservoir contains a supply of water to the end of December, the cultivator is independent so far as his crops are concerned. Ponds of the above description are easily made and at a small cost.

Question 5.

Loans under the Land Improvement Act are not freely taken by the people for the extension of irrigation. It is desirable that instalments be extended to forty or fifty years and not less than thirty years.

No interest to be charged if the *takavi* recipient agree to repay the loan by ten yearly instalments.

The rate of interest to be 2 per cent. If the *takavi* recipient agrees to repay by twenty yearly instalments.

The rate of interest not to exceed 4 per cent. if the *takavi* recipient agrees to repay the loan by thirty yearly instalments.

If the water of the well becomes brackish or unfit for irrigation, or, if the well is damaged, or becomes otherwise unfit for irrigation purposes, the instalments due thereafter should be remitted.

Question 39.

I am not in favour of the construction by Government of wells in land which is private property for obvious reasons.

River Irrigation.

As most of its rivers flow along deep narrow channels with sandy beds, the province of Gujarat is not well suited for direct irrigation. This is especially so, as serious loss of water-supply is caused in bringing canal water several miles from the rivers to command fields on a much lower

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level. At the same time, there are many spots along the course of several Gujarat rivers, where, by means of a frame on perpendicular river banks, water is raised by bag B.

The chief difficulties in river irrigation seem to be (a) high banks in some parts, (b) absence in the river-bed of a solid foundation for weirs, (c) want of suitable sites for storage reservoirs, (d) looseness of soil whereby the loss in soakage is so great, that, even within a limited area, water will only go about half as far as in heavy lands.

The Narbada is the largest river in Gujarat which passes through a portion of the Broach district, most of it, and consequently tidal, unfit for irrigation.

The Surat district has eleven rivers, the Tapti, the Min-dhola, the Purna, the Ambika, the Anranga, the Par, the Kolak, the Damanganga, the Kaveri, the Kharera, the Vanki and the Kim rivers.

The Tapti is the second Gujarat river with a course of 70 miles across the alluvial plain of Surat, of which about 12 miles are subject to tidal influence.

Though no lands are at present irrigated from the Tapti, projects with that object have been framed by Captain Chambers in 1859 with an estimate of Rs. 36,75,000, and by Colonel Trevor in 1867 with an estimate of Rs. 1,32,00,000, and a further scheme in 1871 on a smaller scale with an estimate of Rs. 44,00,000. Attention is requested to a summary of the projects given in *Bombay Gazetteer*, II, pages 15-18 (*vide* also *Bombay Government Selection*, New Series, LXI.)

If protection from famine and not a remunerative return on the outlay be intended, the Tapti is suited for irrigating parts of Mandvi and Olpad in the Surat district and Ankleshvar in the Broach district.

The remaining smaller streams rise in the high-land to the east of the Surat district, and flow westward in many cases over rocky beds between banks wide apart formed sometimes of alluvial cliffs, and at other places sloping gently to the stream. Swollen into torrents in the rainy season, the freshes soon pass off, and in the dry weather only a scanty flow of water remains trickling among stones and in places forming deep pools. About 10 miles from the coast, they are subject to the influence of the tide.

The Surat District has a large garden cultivated area which admits of extension, if proper facilities are given by irrigation. And it is necessary to investigate how far, by storage reservoirs or otherwise, the waters of these rivers might be used for irrigation purposes.

In the case of the Mahi river especially, its high rugged banks prevent its water being used for irrigation; and, so deep is its bed that, it drains rather than feeds the springs near its banks. In the Panch Mahals on account of the broken ground along its banks, the water of the Mahi is seldom used for irrigation.

The Sabarmati, the fourth river in Gujarat, is largely used for irrigation during the fourteen miles of its course along the western limit of the Kaira district.

In the Ahmadabad district the failure of the late rains injuriously affects its rice cultivation. If it can be arranged to give the surplus water of the Sabarmati, if any, to rice fields, valuable rice crop might be saved. This would also materially help the broken peasantry and improve their condition.

The Hathmati and the Khari rivers have already been used for irrigation by the Irrigation Branch of the Public Works Department (*vide* *Bombay Gazetteer*, Volume IV, pages 6-7.)

The Shedhi river in Kaira, after meeting the Mohar, has its water so charged with soda that being found hurtful to crops, its water cannot be used for irrigation (*Bombay Gazetteer*, III).

The Vatrak, flowing in Kaira between alluvial banks about 20 feet high, and with a shallow and falling stream, flows over a bed of sand about hundred and fifty feet broad. Its water is at present much used for irrigation by the help of lifts (*Bombay Gazetteer*, III).

The Khari passing through Kaira and falling into the Sabarmati waters many rice-fields by banks thrown across. Formerly of earth, these embankments have now been replaced by seventeen permanent masonry dams with sluice gates commanding an area of 11,000 acres in eleven villages (*Bombay Gazetteer*, Volume III, page

Wells.

1. In Surat and Broach districts, permanent wells have an average depth of 30 feet. In Kaira, the depth varies from 25 feet to 45 feet, reaching to from 70 to 140 feet in the south along the Mahi. In Ahmadabad, the depth varies from 30 to 60 feet. In the Panch Mahals, as springs are found close to the surface, wells are not sunk more than from 15 to 30 feet. Dohad and Jhalod are better supplied with streams which hold water throughout the year, and are readily available for water-lift irrigation, as in many places their banks overhang.

2. (a) In an ordinary year, the supply in the Panch Mahals is from springs, perennial and sweet. In other districts the supply is by percolation and perennial. In parts of Ahmadabad, it has a tendency to become salt.

(b) In a year of drought, the water level sinks low, especially in Kaira and Ahmadabad. Cases of total failure are not known.

(c) The average cost of constructing a one kos masonry well about forty feet deep varies from Rs. 400 to Rs. 600. There are many old masonry wells in the province of eight or 12 kos, especially in Kaira and Ahmadabad, which would now cost from Rs. 3,000 to Rs. 5,000 to build. An excavation of suitable diameter for one or more water bags being made to a certain depth in the firm soil, until water appears, a circular frame, generally made of *samda* wood which has the virtue of hardening in water, is slipped to the bottom, upon which a brick-work called *tundi* is built up, while the digging work still continues. The superstructure sinks as far as it is possible to dig, in aid of which several lifts are kept hard at work, drawing off the flowing water. In this way the *tundi* is often sunk 15 or 20 feet below the first appearance of moisture. The brick-work intended to be under water, is carefully filled with mortar, cement being only used to finish the upper parts. If the spring should fail after a time, a second *tundi* of smaller diameter is let down on the same principle, and occasionally a third, the cost averaging Rs. 100 for every additional ten feet of digging.

Unbuilt or *kachcha* wells abound in all parts of Gujarat. These are simply holes of from 10 to 25 feet deep, and about three in diameter, dug in the alluvial soil, without brick-work or masonry, costing each about Rs. 10 and lasting only for one year. When one falls in, a fresh hole is dug in some other part of the field. Built wells vary considerably in cost. An average masonry well from 30 to 40 feet deep costs about Rs. 400 to Rs. 600.

(d) The average duration of a properly built well, if kept in repair from time to time is not less than a hundred years.

(e) All through the province the water is raised from wells by the *ramio* or *sundhi* leather bags.

(f) The average area attached to and commanded by a well is three to five acres.

Well Irrigation.

The *bhal* or black soil country in West Ahmadabad, including half the Dholka and the great part of the Dhan-dhuka talukas, has, in ordinary years, a prolific crop of wheat and cotton. But the tract is liable to distress in a year of drought, and cannot be protected by well irrigation, as sweet water is scarce, and the soil has a tendency to get saline.

The same remarks apply to the *bara* or coast tract of the Vagra, Jambusar, and Amod sub-divisions of the Broach district.

In Kaira, except in the north, near the high banks of the Mahi, water is generally found at a moderate depth, and the sub-soil water is so good that wells are not affected by ordinary short rainfall. Consequently all through this district, and most in the tract about Nadiad called *Charotar*, well irrigation is very general.

In Surat and Broach wells are generally perennial and are not known to fail even in years of drought. But well irrigation in Broach is not so general as in Surat and Kaira.

All through the province of Gujarat well water is largely used for the purposes of sugarcane, tobacco, vegetables, condiments, spices, and other garden produce called *bagayat*.

Rice, Irrigated and Unirrigated.

Rice cultivation comprises 16th of the total cultivated area of the province, as being a crop adapted to the soil and climate, and also remunerative. The most productive rice-fields are in the Chikhli taluka of Surat, with 22 per

cent. of the total village area, and also in the Matar taluka of the Kaira and the Daskroi and Sanand talukas of the Ahmadabad district.

The two chief varieties of rice are (a) *Akasia dangar*, which is raised in wet land subject only to the direct rainfall, and (b) *Pit dangar*, raised by auxiliary irrigation from tanks, rivers, and lakes.

As rice requires moisture, low-lying land near tanks or the lower terraces of elevated land into which there is ample drainage, are sought for rice cultivation. *Kali besar*, which is an admixture of red and black, a calcareous clay, is the most productive soil. Next is the reddish clay of Pardi in Surat and Modasa in Ahmadabad; but as a rule the *gorat* or red soils are not retentive enough. Much also depends upon the embankment. A properly embanked *Akasia* pit at the base of a cultivated ridge is almost as productive as fields under tanks, except that the *Pit dangar* owes its superiority to the security against deficient rains and the ability of the rayat to raise the finer variety of *kamod* rice, which do not ripen before the 15th November, a full month after the commoner kinds raised in *Akasia* pit have been harvested. Abundance of water is found to be more essential to the crop than the quality of the soil, which latter admits of improvement by manuring.

Rice land is first prepared from waste or previous *jarayet* cultivation, by making a surrounding embankment to impound rain water, and level the bed at a cost of from Rs. 10 to Rs. 20 per acre according to height of embankment. This is followed by ploughing and cross-ploughing on the first fall of rain in June with manuring if it is intended to secure a good after-crop. Sowing is by (1) broad cast, by (2) drill, or by (3) transplantation. Abundance of water is necessary until the ear appears, after which mere saturation suffices. *Akasia* rice crops frequently fail for want of a few timely showers in September; hence the great value in such cases of auxiliary water resources in the province, though the same may not absolutely be needed in most years for the common qualities of rice. All the fine qualities of rice which require moisture till September and which do not ripen until a fortnight or a month after the others can only be raised by irrigation.

Rice belongs to the *khari* harvest in Gujarat except in the bed of the Tapti in Maudvi in Surat, where a summer rice crop is raised. In the Broach District, rice is grown with cotton and other cereals without any irrigation.

To secure his rice crop it is not unusual for a cultivator, who has no well, to hollow near the field, a small pond in which a supply of rain-water gathers, and if the latter rains fail, is carried into the rice beds by a channel or more often by a water lift, *jhilu*.

Sugarcane is one of the most important garden crops. After the ploughing in June, the sowing begins in November with a harvest in December of from 45,000 to 83,000 canes per acre from a sowing of 3,000 whole canes per acre or 9,000 pieces, each containing from 5 to 7 ears. The field has to receive a flooding after November, and as soon as the shoots appear well above ground, compartments

are formed, and irrigation is applied in turn in every ten or fourteen days, so that the whole field receives about 24 waterings in the year. Land is incapable for the growth of sugarcane every year, and profits of cultivation depend on the results of four and sometimes of five years' rotation of less productive crops. While the cost of cultivation of an acre of sugarcane is almost constant, profits are very uncertain, and no staple varies so much in market value and the rayat cannot afford to keep it in hand. The cost of producing eight thousand canes is about Rs. 187. The best cultivators of sugarcane are in the Amaika valley in the Surat District, where the land is alluvial, and not embanked for rice. In the case of embanked *kali* soil under a well, sugarcane comes in every fourth or fifth year and rice cultivation only ceases in the harvest year of the sugarcane called *rasida*.

Ghau or wheat is both irrigated and unirrigated. It is grown throughout the province in all black and *besar* soils, but its cultivation most specially belongs to the *bara* or coast tracts and the *bhal* or plain country of Dholka and Dhandhuka. It requires good land, not the rich loamy soil of cotton and *juvar* as it is too loose in texture for the wheat crop, which entirely depends on the retention of moisture in the soil. If irrigated it has to be always manured. The irrigated or *Vadina* wheat are of comparatively less market value, which shows that irrigation is not congenial to wheat.

Barley or *jau* is generally an after-crop in garden rice lands or in soils too sandy and open for wheat. It is always irrigated and manured. The tillage and irrigation being the same as in the case of *Sanka* wheat. It is a favourite crop in the *gorat* tracts of Ahmadabad and of Kaira.

Tobacco, when irrigated, is called *pit* or watered. A watered pit yields twice as large a crop as a dry crop. At the same time, the leaf of the irrigated plant is coarser and not more than one-half as valuable. Light or *goradu* land is the soil best suited for the growth of the irrigated crop. The Kaira tobacco wants from five to twelve waterings, according as the well is perfectly sweet or more or less brackish.

Of the condiments and spices ginger, grown in *goradu* or garden land, requires irrigation. Soil of the garden *besar* type is preferable to the *kali besar*, rain on undrained fields being not unfavourable as tending to rot the roots. The field receives about twelve waterings before it is ready to be dug up in November.

In the case of chillies or *marocha*, a small quantity of water is required for the first month. After this, the plants are irrigated after twelve days on failure of rain, and the chillies gathered as they ripen, which they continue to do till March. The chillies raised in wet land without irrigation in the Limbdi villages of the Panch Mahals attain far greater perfection than the same variety watered elsewhere. The condiment *ajmo* is sown by hands in beds in October, which are irrigated once a fortnight. *Methi*, grown in garden lands, is irrigated fortnightly.

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1. Q. (The President).—You are Talukdari Settlement Officer of Gujarat?—Yes.

2. Q. How long have you held that office?—For five years.

3. Q. The whole of Gujarat is under you?—Yes, except Surat.

4. Q. You have been good enough to write a very full memorandum containing a great deal of information about soil and about irrigation. Were you also here during famine?—Yes.

5. Q. I suppose you were working in the province?—Yes.

6. Q. Was there a great deal of distress?—Yes.

7. Q. With your experience and knowledge what do you think is the right thing for Government to do in order to protect Gujarat from the ravages of such a famine as the last?—The conditions of the different talukas and districts vary so much that one system will not suit all; for some talukas wells are the best, for others storage. It is very necessary to consider the peculiarities of each taluka and district. As we can see by a reference to the map of the Ahmadabad district, there is in Dhandhuka Taluka a tract called the Bhal where rice irrigation is not possible but where the natural advantages are so great that 2 to 3 inches of rain are sufficient to raise a bumper crop of wheat.

This area supplies most of the Gujarat Districts and Kathiawar with wheat. This part cannot be protected even at the expenditure of any amount of money, because it is not fit for rice irrigation.

8. Q. Two inches of rain are sufficient?—Yes; for wheat.

9. Q. It will not grow rice?—No. This part suffered the most during the famine. The people were removed with their cattle to those parts where there were facilities for obtaining water.

10. Q. Were they willing to go?—Yes.

11. Q. Did they make irrigation works and use them?—Yes; they came with their cattle and children, constructed works and irrigated their crops, using the water of the Sabarmati river.

12. Q. This water is not taken in ordinary years?—No. This water is not ordinarily used by cultivators.

13. Q. What land did they irrigate?—Waste land.

14. Q. (Mr. Rajaratna Mdlr.).—Government waste land?—Yes, Government and Talukdari; it is not irrigated in ordinary years.

15. Q. (The President).—They did pretty well through the famine?—Yes. In time of acute famine we sent these people from one place to another wherever there were water facilities.

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16. Q. How far did you take them?—Thirty-five miles.

Q. (*Mr. Rajaratna Mdlr.*)—Did the people of this part carry on irrigation?—Yes, during the famine. At other times, the water facilities being good, fodder and other crops are raised in the river side villages.

17. Q. (*The President.*)—Even in famine times?—Yes, with takavi advances.

18. Q. In the taluka of Dhandhuka was there any great distress during the famine?—Yes. People had to go to other places; now they have come back and there were three or four inches of rain last year, and they grew first class wheat and cotton, but unfortunately these crops were destroyed by rats.

19. Q. (*Mr. Rajaratna Mdlr.*)—Rats and locusts appeared after the famine?—Yes; the peculiarity of Chuvai in the Viramgam Taluka is that its brackish water is suited to barley and wheat. Practically barley is an irrigated crop and thrives well on brackish water.

20. Q. (*The President.*)—Is it intensely brackish?—We cannot drink it, but it is very good for cultivation; there are a good many big wells; they are of 8 kos; 6 kos and 5 kos.

21. Q. (*Mr. Higham.*)—Where do the people get drinking water from?—From ponds and tanks, not from wells. They have got big wells, which cost one thousand to two thousand rupees to build.

22. Q. The water is fertilising?—Yes.

23. Q. What do they grow?—Barley and *juari*.

24. Q. I suppose rice is grown?—Yes, in some parts. There are some crops which do not require sweet water. For instance, irrigated rice is sold cheaper than unirrigated rice.

25. Q. What, in your opinion, is the best thing to do for this district in order to protect it against the ravages of another famine?—There are some tracts where well irrigation should be encouraged; then there are other tracts where nallah or river water might be stored and used in times of famine.

26. Q. As regards the storing of river and nallah water, you say there are some sites for this; do you say this of your personal knowledge?—Yes, I say it from my personal knowledge. There are a good many places where it is possible to store water from nallahs and rivers.

27. Q. On a large scale?—Yes, I think, on a sufficiently large scale.

28. Q. Large enough to provide storage for 400 or 500 acres?—Yes, certainly.

29. Q. Do you think there are sites for storage reservoirs bigger than that?—Yes; but no special inquiry has been made as regards irrigation facilities in Gujarat, because Gujarat has been immune from famine for nearly a century. Nobody has thought the subject out.

30. Q. You would make the irrigation of Gujarat the subject of careful study?—Yes; first begin with well irrigation, and secondly utilize river water for irrigation. My opinion is that there are some places where it is possible to make reservoirs and collect water; a special Engineer should make surveys.

31. Q. I think surveys are being made?—Yes. As for well irrigation, I am sure that it should be encouraged.

32. Q. How do you propose to encourage it?—The rules of Government are already very liberal. The Assistant Collector has power to give up to Rs. 1,500, and the Collector can give up to Rs. 2,500, so that if a man wants to build a well, he can take an advance from the Collector and build it; a well should not be subject to enhanced assessment.

33. Q. Is there anything further which has not already been done that might be done to encourage the construction of wells?—No; the rules are very liberal.

34. Q. (*Mr. Muir-Mackenzie.*)—Could the liberality be increased?—Not I think if proper care is taken to work the rules; they are very liberal, the officials have got ample powers. Under the rules, instalments can be suspended. No strict inquiry should be made and no extra assessment charged.

35. Q. You have heard that the last witness said that if a man applies for advance, it would be five or six months before he got his money; that is too long?—Yes, that is the fault of the individual officers.

36. Q. Not the fault of the rules?—No; the rules are very clear and complete; they are very liberal. If any-

thing, it is the fault of the officers; in many places Government directed the Mamlatdars and Assistant Collectors to visit villages and pay the money on the spot.

37. Q. Do you think the rate of interest charged is any obstacle?—I would be inclined to reduce it. Even the present rate of 5 per cent. is rather hard for the cultivator to pay; if he takes Rs. 1,000, he has to pay Rs. 50 a year, and that is too much. I propose that the rate of interest should be reduced to 2 per cent., and the number of instalments increased to 20. If a man is in a good position he would not like to be indebted to Government for longer than he can help.

38. Q. Why not be liberal and take no interest at all?—That would be a good thing.

39. Q. If we say "if you agree to pay this money back in ten years, you have it free of interest," would that have some effect?—I think it would have a good effect. The only question if you charge even a small interest is whether it should be charged or not when the water in the well becomes brackish or unsuitable for drinking purposes; and whether the instalments due in respect thereof should be collected or not. According to the existing rules Collectors have power to remit up to Rs. 100; but total remissions cannot be made as far as I know.

40. Q. (*Mr. Muir-Mackenzie.*)—They can be made by Government?—Yes.

41. Q. (*The President.*)—One or two witnesses have said that the reduction of interest would encourage the people to start making wells without proper consideration?—No, on the contrary my experience is that those who want to make wells are very skilful people. They are generally well-to-do and skilled cultivators.

42. Q. (*Mr. Higham.*)—Do you recommend wells in preference to canals?—Yes; canals on this side do not give sufficient water.

43. Q. If they have sufficient water, then they are alright?—Yes, then they are better than wells; the Engineers must decide whether the water will be sufficient. The proposed Sabarmati canal will save the rice crops if the Engineers see that there is sufficient water. My only misgivings are that the water will not be sufficient.

44. Q. (*Mr. Ibbetson.*)—What interest does the cultivator pay to the *bania*?—I think it varies from 9 per cent. to 15 per cent.

45. Q. But he can get money from Government at 5 per cent.?—Yes.

46. Q. Would he refuse to take at 5 per cent. and go to the *bania* and pay 9 per cent. to 15 per cent.?—Yes, to save time and inconveniences.

47. Q. Do you think that the rate of interest prevents a man from making a well?—Not always. My idea is that well irrigation should be encouraged and that therefore you should give money at a reduced rate of interest. In ordinary times 5 per cent. is a very low rate.

48. Q. Do you think that 5 per cent. prevents a man from making a well any more than if he got the money free of interest?—Yes; in cases where the cost is very great. In some places a well costs Rs. 1,000, but it might cost Rs. 700, Rs. 400 or Rs. 300. It varies according to the depth. Where a well can be constructed for Rs. 200 or Rs. 300, the rate of interest is not very material, but where a well costs Rs. 1,000 it is material. As a rule the *bania* does not lend money for well-sinking.

49. Q. Why not?—He will not; no village *bania* will lend a thousand rupees to a cultivator.

50. Q. (*Mr. Muir-Mackenzie.*)—He will lend money for marriage expenses?—Yes, but ordinarily he will not give more than Rs. 200. In the Viramgam and Dholka Talukas the cultivators who are prosperous can get from Rs. 1,000 to Rs. 2,000 for the marriages of their sons or daughters; but an ordinary cultivator, a *kunbi* or a *koli* or a *dharala* cannot get more than Rs. 200 from the village *bania* who is very careful about lending money.

51. Q. (*Mr. Ibbetson.*)—Have you got many wells in Gujarat?—Yes.

52. Q. When do you think they were made?—Many were made before the original settlement.

53. Q. What did they cost then; do you know?—They cost less than they do now; cultivators worked among themselves; now they don't help each other.

54. Q. All the money that was wanted to make wells was borrowed from the *banias*?—Many had their own money.

55. Q. Most of them had?—Yes; they constructed the wells bit by bit; they began with the initial work, then they did the work on the *mot* side, and then they completed the work. Ordinarily it took two or three years to complete a well.

56. Q. How soon do you recover the first instalment of takavi for wells?—The present practice is to recover after the well is constructed.

57. Q. Do you wait till then?—Yes; the rules are very clear.

58. Q. Would you like to see Government charge only 3½ per cent. interest?—Yes.

59. Q. Do you think that they would rather pay 5 per cent. than have a small charge assessed on the area irrigated?—Yes.

60. Q. (Mr. Rajaratna Mdlr.)—You say that the rules regarding takavi are very liberal?—Yes; but the difficulty is in practically working them.

61. Q. How would you get over that difficulty?—That depends on the officer; a lazy and indolent officer may take six months, while an intelligent officer would give the money on the spot.

62. Q. How do you assess your *akashia* lands; are they assessed at a higher rate than *jarayat* land?—Yes.

63. Q. In your memo. you say, "the scope of garden cultivation is large and deserves encouragement." In what way can encouragement be given?—These people may be encouraged to take takavi and extend cultivation largely. There should be a little exertion on the part of the officers to explain to the cultivators what the orders of Government are and how far Government is willing to help them.

64. Q. Replying to question 39, you say, "there are many spots along the course of several Gujarāt rivers where, by means of a frame on perpendicular river banks, water is raised by bags?"—A good many places.

65. Q. Is it possible to increase the number of such lifts?—It is not possible; where there are facilities, of course, people take water; if it could be arranged to give them flow irrigation, then it would be a good thing.

66. Q. In many cases it is not possible to give flow irrigation?—Yes; where there is irrigation they take water from the river; two men are employed to draw water, that is one style; then a good many people draw water by lifts; and if flow irrigation was given to them, it would be a good thing.

67. Q. (The President.)—Have you any experience of the use of steam pumps?—I saw a good many at work during the famine time.

68. Q. Do you think they are too expensive?—Yes; and then there are very few places where one can put up pumps and take water.

69. Q. In Egypt you see hundreds and hundreds of them.—I think steam engines will not do; the fuel costs too much.

70. Q. In the case of lifts in the Gujarāt rivers, is a water-rate charged for irrigation?—No.

71. Q. (Mr. Muir-Mackenzie.)—What do you think of the proposal that Government should pay the whole cost of the well and take a moderate assessment on the land irrigated by it?—An intelligent cultivator or a private individual might like the idea; but the ordinary cultivator would not understand it; he would get nervous lest the assessment should be enhanced.

72. Q. Suppose a well costs Rs. 500 and that Government should give the cultivator Rs. 500, and where the cultivator formerly paid Rs. 5 per acre Government should say, "we will not recover the Rs. 500, but you will now pay Rs. 10 on each acre irrigated instead of Rs. 5?"—That would be a very good thing.

73. Q. Would he be willing to pay the additional assessment on the well for ever?—Yes; but the well must be constructed by the cultivators themselves and not by Government, so that Government will not be swindled out of their own money and will not have to pay Rs. 500 where the well could be done for Rs. 300. By proper inspection and payment in instalments we can ensure that the money is properly spent.

74. Q. Do you advance money for wells in the estates under your own management, I mean talukdari estates?—Yes; but not in famine times, because, I think, it would

not be possible to complete a well within a certain time; sinking a well in famine times is practically useless.

75. Q. Do you give money out of the talukdari estates?—Yes; for *kuchcha* wells; a *pakka* well cannot be completed in time.

76. Q. But they would give employment?—Yes; but I would not give large advances in times of acute famine.

77. Q. Do you, in the estates under your management, give money for wells in ordinary years?—Yes, but generally the talukdars themselves build wells because they are the proprietors.

78. Q. That is like Government building a well?—Yes.

79. Q. If talukdars can provide wells on the lands of their tenants, why cannot Government build wells on the lands of their *rayats*?—The talukdars have tenants on their own terms who can be turned out at any time; whereas the *rayats* cannot be turned out.

80. Q. You know the Broach and Surat districts?—Yes.

81. Q. Do you think that the drains do any good?—Yes; but in some parts they have done harm. Of course they do good; but the danger of drains is that we don't know whether other lands will be spoiled or not. They have to be carefully watched.

82. Q. (Mr. Ibbelton.)—During the rains?—Yes, water-logging and in some places scouring occurs. I have heard complaints that good land gets scoured.

83. Q. (Mr. Muir-Mackenzie.)—Did you see anything of this during the last year?—Yes, in one place in the Viramgam Taluka. I am not prepared to say whether it was due to the drains or to heavy rain. We are not in a position to give a decided opinion just now.

84. Q. Do you think that the drains carried off useful water this year?—This year there was no proper opportunity to test the subject.

85. Q. Drains are ordinarily wanted to carry off water from water-logged areas; this year the areas were not water-logged?—No.

86. Q. Did the drains carry off water which would have been available in this year of drought?—I don't know; there was not much water, and there was no opportunity to observe.

87. Q. You think that the most useful kind of famine relief work in the greater part of Gujarāt would be the construction and repairing of tanks?—Yes, small tanks for irrigation.

88. Q. Not water-supply tanks so much as irrigation tanks?—Water-supply tanks are made ordinarily by the Local Boards. In times of famine local fund tanks and village tanks carry no distinction. They are all made by Government in times of famine. It would be much better to dig irrigation tanks than other tanks in times of famine.

89. Q. You would give preference to irrigation tanks in times of famine?—I would.

90. Q. Don't you think that *bandhs* or long bunds would form useful famine relief works?—Yes, *bunds* don't cost much.

91. Q. So much the better?—In some places they may do good.

92. Q. (The President.)—Are you opposed to large tanks?—Yes; unless they can be made to give water in famine time.

93. Q. You consider that small tanks are more useful. Was there more water in small tanks than in large during the famine?—Yes; small tanks are useful for irrigation purposes; there are some tanks which are not useful for irrigation purposes; in ordinary years there would be no irrigation from them.

94. Q. Not even rice?—Yes, rice cultivation is impossible without a large supply of tank water when late rains fall and other crops don't want water. If you want large tanks, the existing irrigation tanks might be enlarged.

95. Q. (Mr. Muir-Mackenzie.)—You would enlarge the existing tanks?—Yes.

96. Q. (The President.)—I do not fully understand what you say about the irrigation tanks?—The new tank made during the famine that I have seen are of no use in ordinary times for irrigation.

97. Q. (Mr. Muir-Mackenzie.)—Because the localities in which they are situated are unsuitable for irrigation

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Kirparam.

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purposes?—Yes, but there are existing irrigation tanks which may be improved and extended and made larger and would be able to irrigate a large area of rice.

98. Q. (Mr. Ibbetson).—You would not have Govern-

ment make wells in private holdings?—No; Government should not undertake the building of wells.

99. Q. You do not think that would be a good plan?—No; there are many objections to it.

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WITNESS No. 17.—RAO BAHADUR HIMATLAL DHIRAJRAM, A. M. I. C. E., President, Ahmadabad Municipality.

Answers to printed questions.

The following replies refer particularly to the Ahmadabad District, with which I was connected for about ten years. I was a member of the Public Works Department for about 35 years, have served in all the districts of the Northern Division in various capacities, and was Executive Engineer of the Ahmadabad District for about four years.

Irrigation in the Ahmadabad District may be classed under the following heads:—

- (1) Wells.
- (2) Water-lifts, called Dhekudis, from rivers, nallahs, streams and other sources.
- (3) Tanks, including bunds, in the Sapand, Virangam and Dholka Talukas.
- (4) Canals.

There are in all 13 to 14 thousand wells and Dhekudis in the Ahmadabad District, which irrigate about 50,000 acres. About 25,000 acres are commanded by tanks; and the present canals may be roughly assumed to have a capacity of irrigating about 20,000 acres. Thus wells, tanks and canals command in all about a hundred thousand acres; or about 5 per cent. of the total culturable area of the District may be said to be protected by the existing irrigation facilities. Except a few, all the wells, and a few of the tanks and bunds, are private property. All the canals belong to Government, who control the distribution of water from them under certain fixed rules, and charge irrigation revenue at fixed rates per acre irrigated, varying according to the crop; but this rule is not applicable to lands on the Khari sluices, which were assessed at the time of the survey settlement upon a consideration of the water advantages they obtain from the river. Remissions of the water-rate are given when the crops watered from the Hathmati and Khari Cut canals suffer from an insufficient supply. There is ordinarily a demand for water during the south-west monsoon; and it occasionally happens that, for want of one or two waterings in September and October, the rice crop suffers considerably. The distribution of water from the tanks is made by the cultivators themselves under the general supervision of the revenue authorities. The water-rate for tanks is assimilated with the land revenue, and collected by the village officials in lump without reference to the plots irrigated. The soil is, for the most part, sandy, with the exception of large patches of black soil in the Dholka, Dhandhuka and Virangam subdivisions.

The number of waterings required for the several crops vary according to the amount and season of the rainfall, as also according to the nature of the soil. If the rainfall is deficient, rice requires, between July and October, 5 or 6 waterings after transplantation; wheat 7 to 8 waterings from November to February; and Jowari (as a hot weather or Hari crop) about 6 to 8 waterings from March to May. Sugarcane requires a very large quantity of water, amounting to as many as from 25 to 30 waterings during the year.

Small tanks constructed in black soil, which is light in this District, retain water; and earthen dams, not exceeding 12 to 14 feet in height, can be safely constructed without masonry core walls. As a rule, whether the soil be red or black, there is always a demand for water in the south-west monsoon for the rice crop; and I am of opinion that in projecting new or repairing old tanks, the nature of the soil, whether black or red, need not be a matter deserving any special consideration in this district. The cultivators are already beginning to appreciate the advantages of irrigation; and, as Executive Engineer, Public Works Department, I came across a number of instances in which they expressed their willingness, by all means in their power, to help irrigation schemes.

The only existing Government irrigation works in this District are the—

Hathmati Canal,

Khari Sluices,

and

Khari Cut Canal.

These, however, cannot be much depended on during seasons of drought. Proposals for increasing the supply in the Khari from the Bokh near Parantij are under consideration for several years; and if they are carried out, a large portion of the Daskroi Taluka in Ahmadabad and of Matar in Kaira will be greatly benefited. There is any amount of culturable land available in this District, but not now under tillage, and the cultivators are skilled and industrious. Hence all water facilities that could be provided are likely to be utilized to the greatest advantage. I am not in favour of the Sabarmati Canal, as, owing to the sandy nature of the soil, there is likelihood of a considerable waste by absorption; and I do not think the project could be made financially remunerative.

In my opinion, more satisfactory results could be secured from canals of small lengths from the Meshva and other rivers. Some drainage channels, combined with irrigation facilities, are required within a few miles of Ahmadabad, as, in years of ample rainfall, crops suffer from excessive, and, in years of scanty rainfall, from deficient, water-supply.

In parts of Dhandhuka, Dholka and Virangam, similar works are also much needed; and if they are properly projected after due enquiries, the district will be greatly benefited. Such works, affecting only one or two Talukas, might be carried out with advantage from Provincial revenues. At present no irrigation works are constructed or maintained from other than Imperial Funds.

No new irrigation tanks or bunds have been recently constructed. All the existing works are of a very old date; and by G. R. No. ¹²⁵₁₄₇₃ W. T., dated 15th September 1892, Government have already acknowledged their responsibility to keep them in proper repair. Small sums are being spent from time to time for their maintenance, but in only a few instances, have thorough repairs been made. It is, therefore, difficult to estimate, with any degree of accuracy, the cost of repairs per acre irrigated. The total number of tanks is about 1,200, and the area dependent on them about 25,000 acres. The protective value of these works will be greatly enhanced by restoring them to their original condition, as soon as practicable. I would also construct new bunds where natural facilities exist, so as to increase the irrigable area as much as possible. I do not think such works can be undertaken on any large scale by private agency. Besides, the matter is one of Provincial interest; and I do not think Local Funds should assist, to any material extent, in the improvement of other than village tanks used by villagers and cattle for washing and drinking purposes.

Wells.

The total number of wells in the district is 13 or 14 thousand, which, in years of drought, irrigate about 50,000 acres. In my opinion, the construction of wells should be stimulated by all possible means, and as they afford a really effectual protection from drought and famine, sufficient inducement by liberal advances might be given for their construction in large numbers. The people are fully alive to the protective value of wells from time immemorial. Thus, there is every hope of their coming forward to construct them, provided special encouragement and assistance on the above lines are given by Government.

The average depth of wells in the Ahmadabad District may be put down at from 30 to 50 feet, and the average cost of a well about Rs. 600 or 700. A well, on an average, irrigates from 3 to 5 acres, and if kept in proper repair from time to time, it may be expected to last over a hundred years. In most cases, the supply is from percolation which is liable to fail in years of drought. Some of the wells are perennial. In some parts of the district, *viz.*, portions of Dhandhuka and Dholka, sweet water is scarce and the soil has a tendency to become salt.

All throughout the district, well water is largely used for the purposes of sugarcane, tobacco, vegetables, etc. It is usually raised by means of two kinds of mols called

"Sundhia" or "Ramia" Kos. In a year of sufficient rainfall, irrigation does not make any great difference in yield; but it enables two harvests to be obtained, and also the growing of valuable crops. In years of scanty rainfall, however, it is of great value in saving crops. The annual net value of the produce per acre is about the same in years of ample rainfall as in years of scanty rainfall, with irrigation,—the cost of cultivation being more in the latter case.

No special difficulties are encountered in most parts of this District in the selection of a spot for wells; but in parts where the soil is saline, it is difficult to estimate whether water would be found sweet or otherwise; and, for this purpose, the selection of the spot is made after examination of the depth of neighbouring wells. Hindu writers have laid down certain rules in regard to the selection of suitable sites for wells. According to them, water is met with at a reasonable depth below a site where *rayan*, *Mimosa indica*; *timru*, *Diospyros montana*; *Sando*, *Eriodendro unfractuosum*; *jambudo*, *Syzygium jambolanum*, and *Kerdo* trees grow. The growth of Hariali grass on any spot in the dry weather is also a sure sign of water being found there not far from the surface. Sometimes, in places, a stratum of quicksand is met with in sinking wells, and this increases the difficulties of sinking. I think the Government would do well to supply the use of boring tools to cultivators with expert advice for their use. A few trial borings may also be undertaken by Government in different tracts to ascertain the quality of the water, as well as the depth at which it is obtainable. I am against Government undertaking the construction of wells. As a rule, I am not in favour of Government undertaking works, the value of which the people understand, and which they are themselves able to manage, and in the satisfactory completion of which they are personally interested. However, it would be more satisfactory if a supervising staff is maintained by Government to see that such work is properly done.

Grants-in-aid may be given for the construction of wells on suitable terms; and this, in my opinion, ought to induce people to sink a very large number of wells.

Properly constructed wells alone are generally used for irrigation. Temporary wells are not so largely used, and do not afford much protection against droughts. I think it would be better to provide for a sufficient number of *pakka* wells in normal years, so that the same may be available in years of scanty rainfall or drought. In my opinion, a year of scarcity is about the most unfavourable time for sinking wells; as the people, at such times, being much in want, are chary in spending, being not hopeful as to the result.

To secure this rice crop, it is usual, for a cultivator who has no well, to make a small hollow in a convenient part of his field where rain water gathers; and this is carried into the rice beds by a water-lift, *jhilu*, when the later rains fail.

There are already about 13 or 14 thousand wells in the District irrigating about 50,000 acres; and every additional well is a blessing, as being of great protective value in times of famine. In fact, I consider wells to be the most reliable source of supply in years of drought.

In Viramgam and Kharaghoda, borings were taken at different times to a depth of about 150 feet; but the result was not satisfactory. However, in my opinion, further experiments are desirable, and should be carried out in all parts where difficulties are experienced in obtaining a sufficient and wholesome supply of water.

Drainage.

A few drainage works have already been carried out in parts of Viramgam and Sanand, but much still remains to be done in this direction, not only in the Viramgam and Sanand Talukas, but also in Dholka and Dhandhuka. Large tracts of land in the district remain uncultivated owing to their water-logged condition; and it is to the interest of all concerned to have all such places thoroughly examined, and proper steps taken to make them suitable for agricultural purposes. In constructing drains, provision should be made for utilizing the supply in ordinary years for filling in tanks and irrigating fields. The above-mentioned drainage works are also necessary to improve the malarial condition of the surroundings, due to stagnation of water. Funds for this purpose should be provided from Provincial revenues, especially as such works are likely to result in an increase of revenue by reducing relinquishments and by inducing cultivators to take up fields already given up.

Tanks.

Tanks are supplied with water from their own catchment areas. Some of these have, of late in some cases, been taken up for cultivation. Water from such tanks is distributed by the cultivators themselves. In some of the larger tanks, pipe outlets have been provided. In some, water is drawn by lifts. The supply is not made perennial by any special means, and the required quantity of water is drawn from the tank so long as it is obtainable. It is difficult to say what amount of rainfall is sufficient to fill tanks. In 1900-1901, with a fall of about 16 inches, some of the tanks were only partially filled; while, this year, with a rainfall of about 19 inches, the tanks are practically dry. There are very few tanks in this district from which two crops are cultivated. Rice crops are grown on land commanded by tanks, and the increase in the value of the produce of land in such cases may be put down at about 50 to 60 per cent. People do not use much tank water for irrigation in good years. In years of scanty rainfall, their use is to the extent available; while, in years of drought, owing to insufficient supply, no crops thrive satisfactorily.

How far a too late commencement, or a too early cessation, of the supply affects the value of irrigation depends upon the timely transplantation of the seedlings, etc. If the commencement of the monsoon is late, the bajri crop would fail, but the rice crop would thrive; and, in case it is late for both crops, Rabi would be put in. A too early cessation of the monsoon would affect rice, as well as Rabi crops; and artificial irrigation, in these cases, would greatly help them.

The cultivators generally sow certain kinds of crops when it rains during certain constellations or *Nakshatras*, and are under the impression that, when this is done, the crops thrive. When sown at other times, they are believed to fail through some reason or other. How far their opinion about the matter tallies with the actual facts is a question that needs verification in the light of actual experience. In years of scanty rainfall, fields with wells, or commanded by tanks, irrigate respectively from the wells or tanks. The number of waterings vary from 2 to 4 according to the nature of the rainfall; and if this is not done, the crops would seriously suffer. Irrigation may be said to give approximately an increase of about 40 to 50 per cent. in the total annual value of the produce per acre. In years of drought the crops fail, as the tanks, etc., on which irrigation depends give little or no supply in such years. All petty expenditure, necessary to bring the water to the field, is incurred by the tenant, who expects no recoupment; but, when the expenditure is heavy, it forms the subject of a specific agreement between the tenant and the landlord. The tanks are generally repaired by Government. It is difficult to give the annual cost of repairs per acre, as such cost is comparatively more in small tanks irrigating only a few acres, and less in large tanks having extensive areas dependent on them. In a majority of cases, tanks would require silt clearances once in 20 or 25 years; and the average annual cost may be roughly put down at about one-third of the water revenue derived from them. There are very few, if any, private tanks; and I do not consider it desirable to encourage the construction of such tanks. No special measures seem to have been hitherto adopted for the purpose of preserving the original depth of tanks. There is no data to show what changes have occurred in their beds, etc. Silt is generally removed by excavation, no dredging being necessary, as most of them run dry during the hot weather, and the earth obtained therefrom is used in strengthening the bunds. Occasionally silt is removed by cultivators for purposes of manure.

Next to wells, tanks are useful in affording protection from famine, and it is very desirable that they should be maintained in a thorough state of efficiency. There are about 1,200 tanks in the district having about 25,000 acres of land dependent on them. If tanks are kept in proper repair, as directed in Government Resolution No. 125/1473, dated 15th September 1892, above referred to, irrigation will be greatly benefited. In a majority of cases, water is drawn from tanks for rice crops; and as the late rains generally fail, two or three waterings are required to bring the crops to maturity. The preservation of tanks in proper repair would also, to some extent, assist in securing a good supply of water in the neighbouring wells.

A water-rate on lands dependent on tanks was fixed at the time of the Survey Settlement, and it is collected on the whole area assessed, without reference to the area actually irrigated.

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Canals of continuous flow.

No canals of continuous flow exist in this district with the exception of the Khari, the assessment of lands depending on which is included in survey settlement rates. Increase in the value of produce varies according to the nature of the soil, the supply of water available, and the mode of preparing and cultivating the field; and, in years of normal rainfall, this may be roughly put down at about $1\frac{1}{2}$ times. In some cases, two crops are put in, the first of rice and the second of gram or wheat in cold weather, or of Jowari in the hot weather. In years of scanty rainfall, there is hardly any increase, while, in a year of drought, it would depend mostly on its intensity. In years of scanty rainfall and drought, the crops are more liable to be attacked by rats, whiteants, Khapri, as also by a number of diseases; and this fact deserves to be taken into consideration in forming an estimate of the average return from the land. In this district there are no private canals. Government is the sole proprietor, and charges depend on the area irrigated, except in the Khari Sluice District.

All expenses of a petty nature are, as a rule, borne by the tenant; but, when heavy expenditure is desirable or necessary, it forms a matter of special agreement between the landlord and the tenant. In places where water is allowed to stagnate for a considerable length of time, salt efflorescence is formed. Too frequent irrigation produces this salt efflorescence called "khar." With irrigation facilities, a large area of dry crop land could be converted into rice land, which is a decided advantage. Rice fields are protected by high banks, and only very low-lying and badly-drained fields become saltish. Therefore, if the cultivators are offered sufficient inducements to take interest in their holdings, they would themselves do all that may be found necessary to prevent the damage caused by saline efflorescence, etc. Irrigation is being made in the Khari Sluice District for a very long time. Before the construction of the present sluices, earthen dams were thrown across the river from time to time. Salt land may be roughly put down at $\frac{1}{4}$ th in the Khari Sluice District; about $\frac{1}{5}$ th in the Khari Cut Canal (which was made in 1880); and about $\frac{1}{10}$ th on the Hathmati Canal which is about 25 years old. These figures are only approximate. It is generally believed that only lands which do not completely dry up, become saltish.

Canals of intermittent flow.

In the case of the Hathmati Canal in the Prantij Taluka, a weir, about 1,000 feet long and 22 feet high, is built across the Hathmati river near Ahmadnagar in the Idar State, and water is turned into the canal as required from time to time. At the site of the Canal Head Works, the weir has a drainage area of 520 square miles. The Hathmati Canal, 20 miles long, is completely bridged and regulated. Its first three miles pass through the Idar State. The discharge diminishes considerably as it reaches the tail of the canal.

In the case of the Khari Cut Canal, a weir is built across the Khari river near Ranpur about ten miles north-west of Ahmadabad; and water is turned into the canal, and brought as required from time to time, by means of regulating works which are duly provided. Water is distributed to fields by means of branch and field channels and sluice gates. Water is usually required from $8\frac{1}{2}$ to 4 months, i.e., from July to October. In years of scanty rainfall or drought, the fields require more watering, and it is with difficulty that some fields get even one crop, as the supply of water fails. Canals of intermittent supply give one crop when they run full during the Kharif, and two crops, when they run full during both Kharif and Rabi seasons; and it is only in years of ample rainfall that it is possible to secure two crops for some fields,—those inconveniently situated giving only one.

The chief Storage Reservoir is the Chandola Tank within four miles of Ahmadabad, from which water is distributed to fields as required. The Chandola Tank is fed from the following two sources:—

(1) From its own catchment area.

(2) From the surplus water of the Khari, which is allowed to run through the Khari Cut, after satisfying the wants of the Kallambandi villagers, which have a prior right to the use of the Khari water. The supply has, of late, been increased by the surplus water from the Hathmati Canal, which is brought down to the Khari through the Bhojva Nallah branching off at the 5th mile.

The value of irrigation is considerably affected by the too late commencement or too early cessation of the rain-

fall in case it falls in September and October, when water is much needed for the maturity of the crops. Nowhere in the district is cultivation solely dependent on artificial irrigation, which, in all cases, is only auxiliary to and in aid of the natural rainfall, and useful for the production of the more valuable crops. So long as water is available from a canal or tank, wells are not used: but when the supply from an irrigation work runs short, well water is used when required for the maturity of the crops. When the rains are late, well water is used for seedlings. The value of crops raised in any one year can be only comparatively calculated, as it depends on the market rate whose fluctuations depend upon a variety of causes. In a normal year, an irrigation field may be expected to yield about 40 to 60 per cent. more than an unirrigated field. Though there have now been a succession of two or more bad seasons, the present prices of grain are not much above the normal.

There are no private irrigation works in this District, and the following rates are charged for the supply of water from Government Canals:—

(On the Khari Cut Canal.)

(On the
Hathmati
Canal.)

Kharif (rice)—Rs. 7 per acre . Kharif—Rs. 3

Rabi (wheat and gram)—Rs. 5 . Rabi—Rs. 2

Hot weather crop—
Rs. 1.

The rate is collected on the area actually irrigated, and in all cases of deficiency of canal water, remissions are given on a consideration of the extent of the crop failure. When water is supplied to land already assessed for water advantages, the amount so included is deducted from the charge leviable according to the scale given above. The canals are all auxiliary works and maintained from Imperial Funds, and cost, on an average, from Rs. 2 to 3 per acre irrigated. No change in the present system seems desirable in the present condition of the Province. Neither do I consider it advisable to encourage private enterprise in the matter of important Irrigation Works.

General.

There seems to be no obstacle to the extension of Irrigation arising from sparsity of population and insufficient supply of cattle. Dung is chiefly used for manure, and is not available in required quantities. The soil is, for the most part, suitable for irrigation. In some cases, the same field is irrigated from two or three sources. The supply of water is precarious, and at present depends mostly on the rainfall. Cultivators are, as a rule, poor and have little or no credit, and are therefore not in a position to find funds for the cultivation of rich crops. Fear of enhanced assessment also, to some extent, deters cultivators from improving the soil; and it would be an encouragement to them if Sanads were granted to the effect that no enhanced rates will be charged in future settlements on account of such improvements.

In my opinion there should be liberal rules about remissions and recovery of Government dues, and no hard-and-fast line need be adhered to as to dates of submission of applications for remissions, etc. When Government is satisfied of even a partial failure of crops in any part of a district, arrangements may be made to give early notice of the intentions of Government, and allow reasonable remissions to all affected thereby. Cultivators are generally illiterate; and it would, I think, greatly improve matters if they are assured that, in cases of failure of crops from causes over which they have no control, fair remissions will, as a matter of course, be granted by Government.

I do not think the extension of Irrigation is likely to injure unirrigated lands by attracting cultivators to the irrigated tracts, because the Gujarati cultivators stick to their homes in particular localities, and, being very conservative by nature, are averse to changing places of residence, etc. Further, crops of all sorts, both irrigated and unirrigated, have a demand in the market; and every man has his own ways of thinking and liking. Consequently, there seems little or no chance of unirrigated parts being neglected. Irrigation is yet in its infancy in Gujarat, with much room for its extension; and though cultivators do not as yet fully appreciate its advantages, I have now and then come across a number of instances in which they expressed their willingness to even give up a few acres of land free of charge for extension of Irrigation. The exact information in regard to these cases may, if required, be traced from the Executive Engineer's records. I also remember several instances in

which cultivators applied for additional channels, and further facilities for irrigating more land.

In conclusion, I beg to be allowed to express it as my opinion that though, fortunately, this district, owing to the fertilizing nature of its soil and the enterprise and industry of its inhabitants is not so often liable to famine as other parts of the Presidency, yet, as we have had a severe famine and a continuance of three successive bad seasons—a state of things unknown within the last 50 or 60 years—it is very desirable in the interest of all concerned, to take timely and effectual steps to prevent a recurrence of the sad experiences through which the province has been passing. From what I know of the rivers, and the character of the soil of this district, I do not think canal irrigation can be profitably undertaken on an extensive scale. However, I am sure that with a careful examination of the water-bearing resources of the country, much can be done in the shape of minor canals and drains which would afford material protection to the cultivators in years of scanty as well as abnormal rainfall.

Another important work to which I earnestly beg to invite the attention of the Commission is to increase the present supply in the Khari river from the Bokh, and all other available sources. The undertaking of necessary drains in Dhandhuka, Virangam and Dholka, where large tracts remain uncultivated owing to their water-logged condition, also deserves serious consideration.

The most effectual safe-guard against famine is, in my opinion, wells; and Government should, I think, do all in their power to increase their number. I do not, for a

moment, mean to suggest that wells should be built by Government; but cultivators should be encouraged to sink them on their own account, with the help of liberal takavi advances on easy terms, and of exemption from increased assessment. In fact, they should be assured that improvements, and increased profits due to their enterprise, industry and skill, would, in no case, be taxed. More facilities may also be given by way of takavi.

Irrigation Tanks.—A large number of these have more or less, silted up. They should be restored to their original condition, and provided with necessary pipe outlets, waste weirs, &c. Government are bound to keep the tanks in proper repair, because cultivators have been charged for water at the time of the Survey Settlement.

A thorough reconnaissance of the country may be ordered with a view to the finding out of suitable places for large bunds similar in character to those in the Dholka and Sanand Talukas.

The above proposals if approved by the Commission, will, I am sure, prove an effective protection against famine, which would then, in course of time, be a thing of the past. I would not delay the undertaking of the above works until another year of scarcity recurs, but would formulate plans and start the former as soon as possible, so that, within the course of the next few years, considerable progress might be made and the prosperity of the country sufficiently assured to encourage further expenditure on them. All such works, other than wells, should, in my opinion, not be left to private enterprise, as they require an amount of Engineering skill and affect various conflicting interests.

1. Q. (*The President*).—You were for a long time in the Public Works Department?—Yes.

2. Q. About 35 years?—Yes.

3. Q. Do you know Gujarat very well?—Yes.

4. Q. How long is it since you retired?—More than three and-a-half years ago. I retired in August 1898. Since then I have served for three years in the Improvement Trust, Bombay; I retired from there only six months ago and am now in the Ahmedabad Municipality.

5. Q. You have sent in a long memorandum which is full of important information. You say in it "earthen dams, not exceeding 12 to 14 feet in height, can be safely constructed without masonry core walls" would you not make them higher?—Not in black soil without a masonry core.

6. Q. Have you repaired many tanks?—I have repaired a number of irrigation tanks, but have not made new tanks. I repaired tanks which irrigated over 50 acres because only such tanks were under the Public Works Department. I repaired a lot of them.

7. Q. I understand that Government is supposed to repair all tanks?—Till 1892 there was a rule that all the tanks should be repaired, but since then a list of tanks has been made, and an order has issued that all tanks giving more than a certain revenue should be repaired by the Public Works Department.

8. Q. I understand that the villagers who have small tanks consider that they have a right to demand that those tanks should be repaired by Government?—Yes.

9. Q. You say "the only existing Government Irrigation works in this district are the Hathmati Canal, Khari Snuices and Khari Cut Canal."—Yes.

10. Q. Were you employed in the preparation of the Khari project?—No, but I had suggested during my time some improvements to the Khari.

11. Q. There is a reservoir for the Hathmati Canal in the Idar State?—Yes.

12. Q. Do you know the Sabarmati Canal?—Yes.

13. Q. Do you know if there is a sufficient catchment area—During the season of ordinary rain, is the reservoir quite full?—Yes; in ordinary times it is full.

14. Q. Do you know if after extraordinary rain it overflows?—Yes.

15. Q. Do you think there would be any difficulty in raising the weir?—I think there would be no advantage in doing so.

16. Q. Why?—Because in the first place the cost will be very great and the return will be disproportionate to the cost.

17. Q. You say that "proposals for increasing the supply in the Khari from the Bokh near Parantij are under consideration for several years, and if they are carried out, a large portion of the Daskroi Taluka in Ahmedabad, and of Matar in Kaira will be greatly benefited." Have you studied that question?—No. I had an idea that some changes were proposed and I had to go through the project and make certain estimates.

18. Q. Do you think it is a good project?—Yes.

19. Q. You go on and say "there is any amount of culturable land available in this district." Why was it not taken advantage of—I learn from Mr. Beale's report that irrigation was not tried there. There has not been very much irrigation?—No.

20. Q. Is all the water used that comes down?—Yes.

21. Q. Is it used for rice?—Yes, mostly for rice, wheat and gram.

22. Q. How long do these canals run?—Throughout the year.

23. Q. In a year of drought is there water?—No, I think not.

24. Q. Have you heard whether any survey has been made of the whole of the catchment basin of the Khari to see whether they could make a storage reservoir?—I do not know.

25. Q. You say, "in my opinion more satisfactory results could be secured from canals of small lengths from the Meshwa and other rivers." How long does the Meshwa run?—All the year round; I don't know the discharge.

26. Q. You say "in my opinion the construction of wells should be stimulated by all possible means, and as they afford a really effectual protection from drought and famine, sufficient inducement by liberal advances might be given for their construction in large numbers." Practically what you propose to do is to make the terms easier than they are now?—I think people may be given advances on reasonable terms in order to save themselves from any loss; the advances may be recovered by instalments in twenty or thirty years and rate of interest should be 5 per cent.; if you can reduce it so much the better; the smaller it is the better; the advances may be given in instalments as the works progress.

27. Q. How is it done now?—I think in two instalments; I do not know.

28. Q. What do you suggest?—Give them small sums. I would give them advances from time to time, but there should be every facility for payment, and there should be no delay.

29. Q. Do you think delay prevents people from securing advances?—Yes, it does.

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30. Q. You are against Government constructing wells?—Yes.

31. Q. Because the cost would be greater than the cultivators could do it for?—Yes.

32. Q. Is there any difficulty about drainage of water-logged lands?—Yes; the land has always been water-logged.

33. Q. There is no more land going out of cultivation?—I do not think so, there may be a little in a few places.

34. Q. Do you see salt on the surface?—No; I do not think it is due to irrigation; I think there must be some salt in the soil. Under irrigation a much cropped soil may become saltish; otherwise I do not think it does so.

35. Q. Do you think there is any reason to suppose the efflorescence is getting worse than it used to be?—I do not think so.

36. Q. Have you ever heard of the effects of drainage upon land which is water-logged—Are water-logged lands improved by drainage?—Yes.

37. Q. There are a good many drains, I understand?—One drain was cut in the Dholka Taluka after 1872, and, on the whole, we found it useful.

38. Q. Have you heard complaints against them?—I have not; there are not many drains in this district.

39. Q. You conclude your memorandum by saying "I do not think canal irrigation can be profitably undertaken on an extensive scale." You don't think one could connect the existing tanks in Ahmadabad by canals with rivers so that you can fill up the tanks by flood?—Yes, we may in places if proper arrangements are made. Inquiries in this direction are desirable.

40. Q. (Mr. Higham).—Does rice require 5 or 6 waterings between July and October?—Yes.

41. Q. Is it advantageous to encourage rice cultivation under tanks which are liable to fail?—Yes; generally they help to assist the rice crop.

42. Q. Do you know this district well?—Yes.

43. Q. Would it be possible to arrange to fill a large number of tanks by means of channels taking off from the rivers?—I think that could be done.

44. Q. From what river or rivers?—The Meshwa and Khari rivers.

45. Q. I suppose these rivers run dry every year?—Yes; but the Sabarmati does not run dry. During the rains no rivers run dry. It depends upon whether there is sufficient rain.

46. Q. The channels would not run dry in the rainy season?—In some of the rivers they would.

47. Q. The spill channel would be very deep?—Perhaps; surveys would be required.

48. Q. Are the Sabarmati banks too high?—Yes, above Ahmadabad.

49. Q. Have you ever seen tanks filled from the river?—No.

50. Q. (Mr. Ibbetson).—You say you do not think that the Local Fund could assist materially in extending irrigation?—Yes.

51. Q. Because you do not think it fair to spend Local Fund money on irrigation?—Yes.

52. Q. Suppose Government were to find the money and allot the net revenue to the Local Boards, would they be a suitable agency for making small tanks and repairing them?—I think it would be better to remit the revenue on those small tanks, which are paying under Rs. 20 or Rs. 30. I think the people would rather repair the tanks themselves than pay taxes.

53. Q. Do you think the people would do that?—If they know that the water-rate was to be remitted I think they would.

54. Q. If the assessment is taken off, do you think that they will keep the tanks in order?—Yes, I think so.

55. Q. You think that would be better than giving the Local Boards the revenue and asking them to keep the tanks in order?—Yes, otherwise there will be great bother and the return will be very small.

56. Q. In the case of these very small tanks?—Yes.

57. Q. You say the people do not use much tank water for irrigation in good years?—They take only one or two waterings when there are late rains.

58. Q. You mean not much water is used?—Yes.

59. Q. They only want water when it is of great importance to have it?—Yes.

60. Q. And then they are ready to pay a substantial rate for it?—Yes.

61. Q. You say the average annual cost of repairing these tanks is about one-third of the water revenue; that seems a high proportion?—What I mean is this: suppose we have a revenue of Rs. 300 and we spend Rs. 100 annually, the tanks can be kept in proper order.

62. Q. Would they require Rs. 100 every year for repairs?—No, I do not think so; it may be every 20 or 30 years. The tank will be silting and you would have to make certain repairs.

63. Q. Every 20 or 30 years you have to spend Rs. 2,000 or Rs. 2,500 in clearing the tanks?—I think so.

64. Q. I see that the rates on the Khari are double the rates on the Hatmati Canal?—Yes.

65. Q. Why is that?—I do not know; that was settled before I came here. I think the soil is not so rich as the soil on the other side—it is a poor country.

66. Q. You say that enhanced assessment deters cultivators from making wells?—I do not know whether the people fully understand the matter.

67. Q. Has anything been done to make them doubt that the assessment will not be enhanced?—I am not quite certain; but the general impression is that the assessment will be enhanced.

68. Q. They could be given sanads Would—that be a good thing?—Yes.

69. Q. Supposing you tell them that the revenue is enhanced on account of the rise in prices, do you think they will accept that explanation as true?—That could be explained, but I have doubts about the general rules.

70. Q. Do you think the explanation would do?—Yes; it may be tried.

71. Q. You are in favour of Government building wells on private lands?—No.

72. Q. Do you think the Government can build wells as cheaply as the cultivators?—I do not think the Public Works Department can build them as cheaply as cultivators though they could build them better.

73. Q. (Mr. Rajaratna Mdlr.).—I find that the area irrigated in 1894 is 28,000 and in 1886 the actual irrigated area was 35,000. Is the decrease due to deficiency of supply or to disinclination of the people?—We utilized all we could get.

74. Q. You utilized the whole of the water available?—Yes.

75. Q. You say there are orders that only tanks irrigating over 50 acres are to be under the Public Works Department?—Yes; at present they are under the Public Works Department.

76. Q. And those irrigating less than 50 acres?—They are under the Revenue Department.

77. Q. The majority of the tanks are irrigating less than 50 acres?—Yes.

78. Q. More than $\frac{1}{2}$?—A little more than $\frac{1}{2}$; that was the figure when I was there.

79. Q. In your written answers you refer to the drainage works at Virangam and Sanand?—Yes.

80. Q. Have you heard complaints in some parts that they have proved injurious to the cultivator's lands?—No I think they serve their purpose very well. One drain was made in Virangam and another in Dhanduka; there are no complaints about these.

81. Q. Some of the witnesses say that the rayat went the length of filling up these drainage channels?—That may have been the case since I left the department.

82. Q. (Mr. Muir-Mackenzie).—Do you know any thing of the Chandola tank in which a charge was made for extra water?—Yes; the question was started in my time.

83. Q. Will you kindly state the circumstances of the case?—Before the Chandola tank was built certain lands were assessed with water-rate; then in my time certain people took water from the tank for the purpose of hot weather crops, and I wanted to charge them a water-rate because the original capacity of the tank was considerably increased at the cost of Government. Then we received some petitions in which it was stated that we were

not entitled to charge an extra water-rate as the extra capacity of the tank had been already assessed with the water-rate.

84. Q. (*Mr. Ibbetson*).—You were not allowed to raise the water-rate?—No.

85. Q. On account of the improvements?—Yes.

86. Q. (*Mr. Muir-Mackenzie*).—Were Government informed?—I think the matter went to Government; I sent all the papers to Government.

[*Mr. Ibbetson*.—It is a consolidated assessment?—*Mr. Muir-Mackenzie*.—Yes; a consolidated assessment cannot be altered.]

87. Q. You said that you would like to let water-rate go on small tanks and leave the repairs to the people?—Yes.

88. Q. Are you aware of the orders of Government which direct that whenever a man, owing to the disrepair

of his tank, finds that he cannot get water on his land and applies for remission of water-rate the application should be considered?—It has been passed since my retirement.

[*Mr. Ibbetson*.—He has to apply for a remission?—*Mr. Muir-Mackenzie*.—Yes; the orders of Government were that the water-rate should not be remitted unless some body asked for remission.

Mr. Rajaratna Mdlr..—Is it permanent remission or is it granted each year?

Mr. Muir-Mackenzie.—If the tank is in disrepair and a man does not get water then it is permanent remission.

Mr. Ibbetson.—Next year if you repair the tank and give water?

Mr. Muir-Mackenzie.—That case has not been considered. If people apply for remission the matter will be investigated.]

H. Dhirajram.

4 Dec. 01.

WITNESS No. 18.—MR. GANESH GOPAL PANDIT, Landowner.

Answers to printed questions.

A.—General.

My answers refer principally to a portion of the Daskroi, Sanand and Parantij Talukas in the Ahmadabad District. But I have travelled a good deal and have observed the agricultural state of things wherever I have travelled, and so my answers may refer to other localities also. I am a cultivator in the first two talukas, have set up steam pumps at Fatehwadi and Bakrol in the Sanand Taluka for irrigating my lands in those two villages. I have a friend in the Parantij Taluka; through him I have become acquainted with that taluka also.

2. I have no figures by me by which the rainfall averages can be calculated. But the general rainfall is from about the end of June to the end of August. There is hardly any from January to June. But of late years it is very irregular, insufficient and fitful.

3. (1) In my opinion there is no obstacle arising from sparsity of population, but enterprising and wealthy cultivators, who as such are very few, are wanted.

(2) The supply of cattle is generally insufficient owing to want of sufficient free pasture land and growth of fodder crops, which require to be encouraged by remission of assessments on lands on which plenty of fodder crops are grown. Increase of cattle by judicious breeding and abundant supply of dry and green fodder will be very beneficial to dry as well as wet cultivation. The famine affects and destroys cattle more than man.

(3) The supply of manure is insufficient and most of the stuff is not properly utilized. The principle that soil clay is the best disinfectant and storer of ammonia on account of formation of cycle of double silicates of alumina and soda, alumina and lime, alumina and potash and alumina and ammonia is not understood. The use of salt is prohibited by the heavy excise duty over the most essential ingredient of food of man and cattle and a very useful article of manure for land. Bones and bone meal are exported and not utilized in manuring Indian soil. Instead of takavi being given for manuring land, if manure is provided at a very low cost to cultivators, it would be much better. The State may undertake the production of saline manures, for in that case the Excise Department of Government would bring no hindrance in the way. All agricultural improvements consist in the production and utilization of useful manures. Materials for the production of useful manures are not wanting in India. But there is want of enterprise and it is the duty of the sympathetic Government to encourage enterprise wherever it finds it, if it cannot itself show the way. Irrigated land requires more manure, as much of it is washed by the lower strata, and a part is utilized in building up the crop. Production of manure and use of it on a large scale will make irrigation more profitable than at present.

(4) In my opinion no soil is unsuited for irrigation in India where surface evaporation caused by excessive solar heat serves for drainage, underground as well as surface. Irrigated black soil will improve under underground drainage, I should think.

(5) Uncertainty of irrigation water-supply will be a great hindrance to valuable wet crops, as the money and labour laid out in them will be wasted. In dry ones even uncertain supply will be a great help, when the rainfall is fitful and insufficient.

(6) Lack of capital for the initial expenditure and of funds for the more expensive cultivation of irrigated crops are no doubt great obstacles to the extension of irrigation. It is very difficult now for educated and enterprising culti-

vators to borrow money from capitalists, for owing to the so-called "Amendment" in the Revenue Code all right over the land except that of cultivation is taken away from the cultivator. He cannot sell or mortgage any portion of it. Capitalists will not therefore advance money to cultivators for necessary improvements. It becomes therefore the duty of Government to help the helpless but enterprising and educated cultivator in his works of irrigation.

(7) Fear of rent being enhanced or revenue assessment increased will no doubt act as an obstacle to the extension of irrigation. Fixed settlement will remove this difficulty.

(8) Uncertainty of tenure or defects of the Tenancy Law throws great obstacles in irrigation being extended.

(9) Poverty, general ignorance, want of even rudimentary education, the general apathy on the part of Government officials that come in contact constantly with the agricultural population, etc., may be mentioned as other reasons that directly or indirectly serve as obstacles to the extension of irrigation.

4. Lands irrigated from works constructed by private capital are, as far as I know, exempted from enhancement of assessment, during the tenure of the Survey Settlement, in which the irrigation work is constructed.

5. Loans under the Land Improvement Act are not freely taken by the people for various reasons; some of them may be mentioned as follows:—

- (a) Machinery of Government for granting these loans is too intricate.
- (b) Village officers through whom these loans are settled are generally corrupt.
- (c) Loans when granted are too late, i.e., not timely.
- (d) A portion of the loan given does not reach the cultivator.

• (e) Sympathetic expert advice from a Government officer, who is empowered to grant loans and who is a man of good character of established merit, will go a great way in stopping all sorts of corruption, and encourage cultivators to make irrigation improvements on their lands.

I would recommend the measures suggested in questions 1 to 6 according to circumstances to be considered by a body of village Panchayat presided over by the Mamlatdar or his Aval Karkun of the taluka in which the land lies.

6. No. Irrigation would attract those only who are enterprising as well as those who have not got sufficient means to carry on their agricultural business in their own localities. Exceptionally bad years would drive away people from localities where there is no water, or very little.

Yes. I have people from the Dhangadra State come to my irrigated lands to cultivate. People of Fatehwadi and Bakrol would be glad to take my pumped water if I would give them in their lands. But Government has restricted me to certain survey numbers only to which I can give water without having to pay any additional water-rate.

7. Irrigation would increase the value of the produce of land—

double by (1)

three or fourfold by (2).

It will remain stationary under (3) (a); in (3) (b) will be as good as in (3) (a); in (3) (c) it will be fair only.

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8. My estimate of the increase in the total annual value of the produce per acre due to irrigation would be nearly double on the average of a normal term of years, and 3-2 in a year of drought.

9. In the Daskroi Taluka we pay Rs. 7 per acre for monsoon waterings, when rain is not sufficient or timely for rice cultivation. The supply is given from the storage made in the Chandola Tank from the Khari Cut. In the Parantij Talua, they pay Rs. 3 per acre, under the same circumstances. These rates are paid on the area of the land actually irrigated.

11. Yes. Carbonate of soda accumulates on the land which has been continually irrigated during monsoon, and which lies in the immediate vicinity of the Chandola Tank storage on a low level. Such lands, I think, can be improved by deep ploughing and proper manuring, by drains all round the field, if possible, by growing such crops as would take up the too much moisture and the salts accumulated on the land. I have seen some of the lands of Danu Limda near Ahmadabad spoilt in this way. I suppose the irrigation of the Danu Limda rice land is more than 100 years old. When the supply of rain water is plentiful, rice plantation thrives well, but when it is insufficient, the evil is increased. My experience of draining irrigated lands is that they remain free from the above evil.

12. Wooden plank dams or masonry dams are thrown

1. Q. (*The President*).—You are a land-owner, I understand, in this district?—Yes.

2. Q. You irrigate your land with steam pumps?—Yes; I have two pumps in use on my land.

3. Q. Are they on the river?—Yes; one is on the river and the other is on a well in the river-bed.

4. Q. What is about the height, which you have to lift the water?—The one at Fatehwadi 23 feet, and the other at Bakrol 27 feet.

5. Q. What pumps are they?—Wynne's centrifugal.

6. Q. What is the diameter?—One is 10 inches and the other 7½ inches.

7. Q. Have you used them for many years now?—I have used them for two years.

8. Q. How much fuel do you burn?—If the engine is in proper order, I burn 50 to 60 maunds in the 10-inch pump in 10 hours, and 30 to 40 maunds in the other.

9. Q. Are you satisfied with the experiments?—Yes; I would recommend other people to do the same thing. The channels should be *pakka*, as the quantity of water lost is great; and the earthen channels give way; I asked Government for help to make them *pakka*, but they would not do so.

10. Q. How many acres do you irrigate?—In the famine year, I irrigated 200 acres with the bigger pump.

11. Q. What are the crops grown?—Mostly fodder crops: *guari* last year; and this year I have sown wheat.

12. Q. They are not used for rice?—No.

13. Q. Do you find that this distinctly pays you?—It does not pay me yet, because I have not got proper channels: these give a great deal of trouble. I have to stop the pump now and then, to repair the channel.

14. Q. Are the channels above ground?—In the village of Fatehwadi, I have 1,200 feet of under-ground channels, there was back pressure, and the under-ground channels sometimes burst. I also had high earthen channels, but these too gave way. I have now lowered the channels. My land is level, and there is now less trouble than before. Properly speaking, I have not had sufficient opportunity of testing the profitableness of the concern.

15. Q. Have you used cotton stalks for fuel: they use them largely in Egypt?—Yes, I have.

16. Q. I suppose you can hardly tell what your expenses are per acre?—No.

17. Q. Do other people come to you and ask for the use of your pumps?—They ask for water; but I am not permitted to give it to any land except certain specified land. If I give water to other people, whose names are not included in the Government list, a water-rate is charged.

18. Q. Does that fact prevent them coming?—Yes, it does.

19. Q. It makes it too expensive for them?—Yes.

across the Khari at Rayapur and water is thus raised in the river towards the source. This higher level of water in the river can irrigate all the low-lying lands in the vicinity of the river. In some cases storage tanks, which lie below the level of the river bed, but higher than the land to be irrigated, are stored with water and the low-lying land is irrigated then by means of canals. In a year of ample rainfall good supply is maintained for four or five months. In a year of scanty rainfall, the supply is hardly kept at a workable level even for a few days after the cessation of rainfall. In a year of drought there is hardly any water in the storage tank.

13. I would give the same answer to this question as I have given to question 7.

14. If the irrigation is commenced too late or ceases too early in a given year of scarcity of rainfall, its value is altogether destroyed.

15. Irrigation in a few cases is supplemented by irrigation from wells given to the same land. It is essential to those irrigation works which depend for their supply on small rivers, which depend for their supply of water on rainfall or on storage tanks supplied or fed by these small rivers.

16. I would answer this question as I have attempted to do question 8.

20. Q. What is the water-rate?—Re. 1 per acre. I am not charged for my specified land.

21. Q. (*Mr. Muir-Mackenzie*).—You have taken up waste lands?—They were all culturable lands.

22. Q. They were unoccupied?—Some I purchased from occupants; some I took from Government.

23. Q. (*The President*).—Do you feel anxious this season about the lowness of water in the Sabarmati?—I think we can get water all from wells in the bed.

24. Q. Is there any idea of forming a Company to get more pumps?—If they see that my enterprise is successful, people might come forward.

25. Q. How much will your pump irrigate?—The 10-inch pump will irrigate 300 acres.

26. Q. (*Mr. Muir-Mackenzie*).—Would it irrigate more than 300 acres?—If the channels held more water, I could irrigate more.

27. Q. (*The President*).—Is your land close to the river?—Yes; there is only a village between.

28. Q. Did you import the pumps from England?—No; I purchased them second-hand.

29. Q. Are they satisfactory?—Yes.

30. Q. Does one Engineer look after both?—Yes; I don't work them together.

31. Q. How far apart are they?—Two miles.

32. Q. You say in your memorandum "the use of salt is prohibited by the heavy excise duty over the most essential ingredient of food," it is the duty that has stopped that?—Yes, with excise we get 27 pounds per rupee; I don't know how much is excise charge.

33. Q. You say again "bones and bone-meal are not utilized in manuring Indian soil"?—Yes; I suppose agriculturists do not understand their use. Government ought to make some provision for teaching agriculturists their use.

34. Q. There are Government farms and an Agricultural Department?—I don't know of any here.

35. Q. Do you believe that, if salt was cheaper, it would be utilized?—Yes; some of the cultivators understand its use; others will have to be told; and they will soon learn the benefits of manuring.

36. Q. You say in your memorandum "surface evaporation caused by excessive solar heat serves for drainage under ground as well as surface." Can you tell us any facts about irrigation on black soil?—I have some soil in Fatehwadi, which does not deteriorate by irrigation: our solar heat is so great that a good deal of water is evaporated.

37. Q. Do you think any good has been done by irrigating black soil: would it be the same without irrigation?—No.

38. Q. Many witnesses have said that black soil can get on without irrigation, except in exceptional seasons, and that it is waste of water to irrigate it?—That is not my experience.

39. Q. You say, in paragraph 5 of your memorandum, that there are many obstacles in the way of obtaining loans. Can you suggest any improvements?—At present application has to go through the village officers, and they have to be squared by fair means or by foul, and then only will they forward the applications. It takes a long time. It took more than a year before I got a reply, and that was in the negative.

40. Q. Was it a reply about takavi?—Yes.

41. Q. What should be done?—A cultivator should know if he is to get an advance as soon as possible.

42. Q. You say village officers are generally corrupt?—Yes; especially the lower officers: big officials don't take the trouble to go into matters, and petty officials manage everything.

43. Q. What would you do to make the province better able to resist famine?—I should say that the rain water, which is now wasted, should be utilized by being stored in tanks, and more irrigation tanks should, if possible, be made.

44. Q. (Mr. Higham.)—Where do your pumps lift water from?—One direct from the Sabarmati river and the other from a well.

45. Q. How much do they deliver?—If they work at full speed, one delivers 18 lakhs of gallons in 12 hours, and the other about 8 lakhs; but I cannot work them at full-speed owing to the channels.

46. Q. What is the amount they irrigate?—On the big-pump 300 acres and on the smaller one 50.

47. Q. Is it cheaper than raising by bullocks?—Yes.

48. Q. Are you quite satisfied?—Yes; but I shall be more satisfied when all the arrangements are complete.

49. Q. You carry some of the water through pipes?—I have made an under-ground gutter.

50. Q. What is the matter with the channels?—There are holes in them through which I lose water. A good deal of damage is also done to the land, and the channels give way.

51. Q. Do you puddle your channels?—I have used a little clay, but it does not hold well.

52. Q. What charge do you make to others for the supply of water?—In a famine year I charged very little—Rs. 1 per *bigha* which is $\frac{1}{4}$ acre. Lately some people from Kathiawar have come, and settled on my land. They find the seed, and I give them water and land, and we divide the produce equally.

53. Q. Has any body else got pumps?—There is another man who has had a pump for one and-a-half years. There were some pumps in Khaira, but the river water has run down, and so the pumps are not working.

54. Q. You say in your answer to question No. 9 "in the Daskroi Taluka we pay Rs. 7 per acre for monsoon waterings; in the Parantij Taluka they pay Rs. 3 per acre, under the same circumstances." Why is there this difference?—I don't know.

55. Q. (Mr. Ibbetson.)—How much land do you own?—About 1,100 acres.

56. Q. Is your occupation merely that of land-owner?—Yes.

57. Q. You say you have been irrigating black cotton soil with pumps?—Yes.

58. Q. What crops do you irrigate?—*Juari* and wheat.

59. Q. *Juari* is grown in the monsoon?—Yes, and also in the hot weather. I did not irrigate this year in the monsoon, but I did in the famine year.

60. Q. Do you think that the *juari* and wheat that you irrigated took more water owing to the black cotton soil than it would have in other soils?—No.

61. Q. We have been told that a great deal of water runs to waste in black cotton soil; that is not your experience?—No, my experience is to the contrary, i.e., that it requires less water. It can hold water for some time.

62. Q. After you have given water, if there has been no rain, does it require watering again?—Yes.

63. Q. Do you manure the whole of the area you irrigate?—My soil has a good deal of manure at present.

64. Q. When salt is given as manure, how much is used?—A mound to an acre.

65. Q. What crop would that be good for?—Any crop.

66. Q. On any soil?—Yes.

67. Q. You say in paragraph 7, "the fear of rent being enhanced or revenue assessment increased, will no doubt act as an obstacle to the extension of irrigation." I thought that, in Bombay, the assessment was not increased on account of private improvements?—I cannot say.

68. Q. You know the law is that it should not be increased?—It is a fact that it was increased.

69. Q. You don't know why it was increased?—No.

70. Q. Nothing but a permanent settlement would remove your doubts?—No.

71. Q. You say at Patchwadi and Bakrol, people would be glad to take water, if they did not have to pay the water-rate, what do they pay?—Half the produce, *minus* half the assessment.

72. Q. That would be more than you are getting from your own tenants?—I have not thought about it.

73. Q. (Mr. Rajaratna Mdlr.)—What extent of land was given to you free of assessment for irrigation by your pumps?—I applied to Government to take water free of charge, and Government replied that I could irrigate free of charge the land I then occupied.

74. Q. What was the area of that land?—Nearly 1,000 acres.

75. Q. You can irrigate the whole of that without paying anything beyond the dry assessment?—Yes.

76. Q. Do the orders of Government prevent you from selling your water to other rayats?—It is not the order of Government, but I know this by experience; outside my specified area, there is a field which I irrigated, and because I irrigated it, they charged me Rs. 3-8 for the use of the water. I contended that it was necessary for me to have my channels through that field, but they would not remit the water-cess.

77. Q. Is there any injustice in Government charging a water-rate for selling your water to other people?—The injustice is this. People are allowed to take river water free of charge, and if I give the water at my expense, Government charges me for that.

78. Q. You are not making a free gift of it?—I was taking the same rate as I charge on my land.

79. Q. Is it not fair, then, that you should pay a share to Government? What is the ordinary charge?—Rs. 1 per acre.

80. Q. What will the *rayat* pay you for the water?—He would pay me one-third portion of his gross produce any day; I will charge in future half the produce *minus* half the assessment.

81. Q. What does that represent in cash?—About Rs. 40 to Rs. 45 per acre, gross value.

82. Q. And you grudge paying Rs. 1 to Government. The orders of Government do not prevent you from extending your improvements?—No.

83. Q. You say in paragraph 6, "it is very difficult now for educated and enterprising cultivators to borrow money from capitalists, for owing to the so-called 'amendment' in the Revenue Code, all right over the land, except that of cultivation, is taken away from the cultivator, he cannot sell or mortgage any portion of it. Capitalists will not therefore advance money to cultivators for necessary improvements." Have you any facts to support this statement?—That is the Act.

84. Q. How long has that been in operation?—I don't know; but I know that a *sowcar* would not lend me Rs. 5,000 on mortgage because of the new law.

85. Q. You can borrow from Government?—I asked Government for Rs. 10,000 and Government would not give it.

86. Q. What was the reason?—Probably the reports of the District Officer.

87. Q. If it was for land improvement, Government would not refuse. Did you require it for other purposes?—I wanted Rs. 10,000 for improvements.

88. Mr. Muir-Mackenzie.—Money had to be given to poorer people; that is my surmise.

89. Q. (Mr. Rajaratna Mdlr.)—You don't lend money yourself?—No.

90. Q. It was said by some witnesses that *banias* will not advance money for wells, is that the case?—I cannot say now, under the new Act: they used to advance it.

91. Q. Did they advance it freely before?—Yes, to those people with whom they had dealings.

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92. Q. Would they give Rs. 1,000 or Rs. 500 for a well at a time?—No, not so much, if the cultivator was not a well-to-do man.

93. Q. Was this Rs. 10,000 that you asked for for your channels?—Yes, and for cattle.

94. Q. You reckon that your cost comes to eight annas per acre per watering?—Yes, when all the arrangements are complete.

95. Q. How many waterings will you give for wheat?—Five or six.

96. Q. How many waterings for *juari*?—Four or five.

97. Q. In an ordinary year, would you want so many waterings?—Not in the rainy season: wheat would want generally about four waterings.

98. Q. In what month do you give the first watering?—In October and November.

99. Q. In an ordinary year, the land would be well saturated by that time?—Yes, and it would be ploughed.

100. Q. In an ordinary year, when would you give the first watering?—If I had commenced sowing wheat, and if there was no moisture I should have to give it at once. In an ordinary year I should give it in November.

101. Q. This soil is mostly black soil?—Some is black some alluvial and some sandy, but most of it is black.

102. Q. The same as in Broach?—Not exactly the same; there is a good deal of sand in it.

103. Q. What sort of crops would it yield without irrigation?—It will give a cotton crop.

104. Q. Does black cotton soil crack much in the hot weather?—Yes, it does.

105. Q. How deep is it?—Five or six feet with *kunkur* below.

106. Q. Have you had any experience of irrigating cotton?—No; I have a small area on which I have irrigated cotton, but the rats eat it and I have not completed my experiment.

107. Q. Was it owing to the *talatis'* obstruction that it took a year for you to get a reply to your application for a loan?—I cannot say.

108. Q. Do the village officers give you much trouble?—They don't give me trouble, but they do not attend to my wants.

109. Q. You did not submit your application through the village officers?—It went to the Collector, but it has to go to the village officers for report.

WITNESS No. 19.—Mr. PESTONJI MENABHAI KHERGAMWALLA.

Mr. Pestonji.

6 Feb. 02.

1. Q. (The President.)—You are part-owner of a steam pump?—Yes.

2. Q. What is the size of the pump?—There are two pumps: one is a 12-inch one, and the other 15 inches.

3. Q. What is the horse-power?—12 and 15 respectively.

4. Q. Are they set up on the banks of the Sabarmati?—Yes.

5. Q. Have you any land of your own in that place, or do you merely sell water?—I sell water to the cultivators, but receive part of the produce in payment, not cash.

6. Q. How much?—One-fourth of the rice crop and one-third of the wheat and sugar-cane.

7. Q. (Mr. Higham.)—Is that for water only?—Yes, the land is not mine.

8. Q. (The President.)—Has the cultivator to pay a water rate to Government as well?—There is no water-rate on the land, Government have given me the right to use river water free up to 500 acres; if I give water to over 500 acres, I have to pay, but the terms have not yet been settled by Government.

9. Q. How much do you irrigate now?—This year I have irrigated 300 acres; the pumps could irrigate 1,500 to 2,000 acres; they are not able to irrigate a larger area, because the channels give way under the pressure of water; besides this, some damage is done by rats.

10. Q. Are you one of the partners of a company?—Yes, there are two or three partners.

11. Q. Is there a ready demand for the water?—Yes, there is a great demand for it. This year there has been a complete loss owing to the destruction caused by rats and locusts.

12. Q. Are you encouraged to go on?—Yes, we have made an application to Government for aid; we have asked Government for a lease of land in order to grow *babul* trees for fuel for the engines. If this is granted, our speculation might become a profitable concern.

13. Q. In that case, do you contemplate extending your operations and buying more pumps?—We will extend our work by putting up pumps at 2 or 3 other places.

14. Q. I suppose you could put them up at a dozen other places if it is profitable?—Yes, one of my partners, Mr. Shaikadum Essoibhoy, is a big importer of machinery in Bombay. At present the people are willing to put their lands under sugar-cane, but the *sowcars* have no money to advance.

15. Q. If takavi was available immediately, would they put a large area under sugar-cane?—Yes, they want the money for seed.

16. Q. Do you consider that the rates are sufficient to make it a profitable business?—Yes, if I continue these rates, it will pay in the future. If I convert the produce into cash, it will come to about Rs. 5 to Rs. 6 per bigha, which will be equal to about Rs. 10 or 12 per acre.

17. Q. What is the lift of your pumps?—Thirty feet (centrifugal.)

18. Q. I suppose the engines are portable?—No, they are horizontal fixed engines.

19. Q. (Mr. Higham.)—How many cultivators do you supply with water?—Two or three villages.

20. Q. How is the distribution managed?—A roster is fixed and the cultivators get it in turn.

21. Q. During his turn is a cultivator allowed to take as much as he likes?—Yes.

22. Q. I suppose the number of days a cultivator has to wait will vary with the crop?—Yes, wheat takes 4 waterings; rice took 4 this year; sugar-cane requires 50 to 58 waterings, and is irrigated every four days.

23. Q. That is not during the rains?—No, but if the rain stops for a month it requires water.

24. Q. (Mr. Muir-Mackenzie.)—Is cotton grown?—No.

25. Q. Are there any difficulties in getting applications sanctioned?—No.

26. Q. Have cultivators any difficulty in getting manure?—No; the soil is very rich.

SEVENTEENTH DAY.

Ahmadabad, 5th December 1901.

WITNESS No. 20.—The Honourable Mr. F. S. P. LELY, C.S.I., I.C.S., Commissioner, N. D.

Note by witness.

Mr. Lely.

5 Dec. 01.

The Province of Gujarat has for the most part been formed by alluvion, a process which is still going on. An arm of the sea which once separated it

Natural silting up of the drainage of the Province.

from Kathiawar and is now represented by the Ran of Cutch and the chain of lagoons known as the "Nal" has been filled up within comparatively recent times. The effect has been to silt up the lower courses of the rivers

of that region so completely that instead of reaching the sea they spread out over the country forming water-logged tracts with the usual accompaniment of saline efflorescence. Such has been the fate of the Banas which once emptied itself into the Ran of Cutch, of the Utavli, the Nilki, the Bhadar, the Kodh river in Sanand taluka and others of small size. The same process is, if I am not mistaken, going on all down the coast of Gujarat as far as the Tapti clogging the drainage of the country. The whole Gulf of Cambay is being filled up with shoals, leaving only a narrow and devious water-way, as may be seen on any chart. The Matar taluka, once thoroughly drained by the Watrak and the Sabarmati, is now so obviously deteriorating that Government have had to make one reduction in the assessment and will soon have to make another. The town of Cambay, once upon the bank of the Mahi, is now removed from it by several miles of alluvial bank. There are water-logged areas in Broach districts north and south of the Narbada and in the Olpad taluka of Surat. At the same time the popular voice is unanimous that in the rivers that command these areas the volume of water is much less and the beds higher than they were within the memory of living men.

2. If the above impression is correct, it seems likely that the successive rivers from north to south, beginning with the Bhogawa and Sabarmati, will silt themselves up and stagnate over the country, or find themselves other courses. In my opinion the subject should be thoroughly examined and reported on by an expert Engineer, so that broadly-conceived measures may be taken to prevent the deterioration that has begun.

3. *Irrigation by Canal.*—This is not everywhere possible and where possible it is not always suitable. In the southern half of Surat district it is not needed, because, with a heavy and generally constant rainfall and a retentive soil, a second crop (leguminous) is grown after rice without any artificial watering. North of the Tapti the soil becomes black and is devoted to cotton, which is not picked until the cold weather is over. It is said that watering makes it run to wood and leaves, but however that may be, the extra cost would not be recouped at present prices. Nor is there anything to take its place. The people would certainly not take canal water in the black soil country between the Tapti and Mahi rivers, or in the west of the Ahmedabad district. It would also be superfluous in land so retentive of moisture. In the sandy soil of Parantij taluka again, the Hathmati Canal has been a failure, because among other reasons the loss in the channel by percolation is enormous and because the rice beds will not hold water without great wastage.

4. The only tracts where a canal supply would be welcomed by the people are adapted for rice fields, the sand being mixed more or less with loam. In many villages on the Khari system the soil is so light that it would almost never support a rice crop to the end without the artificial supply. Even in other more retentive soils the latter rain fails in two or three years out of five, but if water could be guaranteed through the cold weather, a second crop of barley or wheat could be secured (provided there was manure), whether the rice needed watering or not. The value of a canal reaches its climax in those villages where the wells are salt.

5. Although canal irrigation is not as a rule suited to Gujarat, I should not oppose certain well considered schemes. Objections are: (1) the great difficulty of securing a supply which may be depended on in years of scanty rainfall, i.e., in the years when it is most wanted; (2) the danger that projects may be adopted as were those of the Hathmati and the Tapti canals, on engineering rather than on agricultural considerations; (3) the temptation to the cultivators when water is brought to them without effort to overcrop their land and to overflow it. On all these points and on others, wells have the advantage. On the other hand there are tracts where though the land is good and the cultivators intelligent, many of the wells are brackish. In those tracts a canal scheme might be considered if otherwise feasible, if a supply can be assured and if the soil is suited to rice cultivation which is and will long be the chief crop in Gujarat to need irrigation.

6. It is for the rice crop alone that the *system of irrigation tanks* in Gujarat came into existence. They have come down from Native rule. Their necessity is based on the fact that in probably 3 years out of 5 the yearly rainfall suffices for sowing, transplanting and bringing the plants forward,

but fails at the last when water is needed to mature them. They are sometimes nothing but basins in the corners of fields which conserve the early rain to be paid out some weeks later. They then run dry, whether large or small, for they are not dug deep. Their bed should be higher than the surrounding country to allow the water to run on to the fields by gravitation. It follows as of course that they are of no use for watering *rabi* crops, though they are often the means of saving a most valuable outturn of rice. It may be mentioned here that the "Kamad" rice grown in Northern Gujarat commands the top price in the market, being the only sort the wealthy classes will eat. Successive good crops would probably pay the cultivator better than sugar-cane.

7. The particulars of these irrigation tanks will be before the Commission, as also the declarations of the highest authorities that Government is bound in honesty to keep them in repair in return for the special water-rate which forms part of the assessment. They have not been repaired as they should be, for reasons the Public Works Department will explain. I have only to suggest that the preference given to people who contribute 10 per cent. of the cost should be abrogated. This would leave the Public Works Department entirely free to take up systematically groups of tanks year by year, which would tend to economy and thoroughness.

8. It has not been the practice to give remissions of land revenue when these works fail. They should be given with reference to the general area-estimate of crops but not with reference to the water as distinguished from the soil. For if the crop fails, the whole fails and a remission of the water-rate only, retaining the soil rate, will not meet the case. The division between the two heads is made in the survey records but differently in every district, and there would be room for difference of opinion as to the correctness of the adjustment. I am myself of opinion that as a rule enough is not credited to water.

9. The repair and construction of such works, if not undertaken by a private landholder, concern the Imperial land revenue only, and are altogether outside the sphere of District Boards. When expenditure is incurred by the Public Works Department on an irrigation tank which is also a village tank used by the people for drinking, bathing, or watering cattle, etc., it is the practice in this division to get a contribution from the District Board. If private landholders wished to undertake work of this kind on their own land, they could readily obtain takavi for it, but they never do.

10. I do not agree that a good deep *village tank* such as was dug in large numbers in recent famine time is useless even although not used at all for direct irrigation. In olden times it was one of the first benefactions that occurred to the man of means who wished to spend his money for the public good. A sheet of fresh water which holds out through the year is a centre of health and sweetness. It humidifies the atmosphere. It is a means of cleanliness to man and beast. Above all it permeates to all the wells within its influence and corrects their brackishness if it exists. Remarkable instances of this could be adduced. On the whole, I am of opinion that in arid, saltish tracts there is no more beneficial form of famine labour possible than sinking a well-planned tank for storing rain water.

11. Similar to these are *water pounds in rivers* where owing to rocky beds they can be made without great expense. In the river Wanki, south of Bulsar (Surat district), the B., B. and C. I. Railway Company made some years ago a masonry bund with a sluice in order to provide a supply for their station near at hand. The result is a permanent store of water which is a delight to the eye. By saturating the adjacent country and also by means of dekadis it has changed a limited area into a perennial garden. Many such bunds and sluices would be possible in the small rocky rivers of that part of Surat district, and also I should think in the upper courses of the Mahi and other rivers. They would probably not be remunerative to Government at first for several reasons, but they ought not to cost much on well selected sites, and they would conserve in the most beneficial form masses of water which now run off useless. The people would slowly learn to take full advantage of them.

12. A modern form of enterprise is the erection of *irrigational steam pumps* on rivers, river banks. I know of four on the Sabarmati and one on the Watrak, and there may be others. The water is generally supplied to the cultivators

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in return for a half share of net crop. These undertakings should be encouraged by Government by imposing reasonable and uniform conditions, and the possibility of their great extension should be borne in mind when framing such schemes as the Sābarmati canal.

13. First, however, in the list of irrigational methods in Gujarat must be placed wells constructed by the people themselves. The fact that a cultivator is willing to take the risk and trouble of making the well and of drawing the water is a security that he has the means to make it a success,—the knowledge, the energy, the appliances and the manure! The canal and the gravitation tank made by Government guarantee none of these things. In restricting both the number of wells and the amount of water daily supplied to the land the co-operation of the cultivators acts as an automatic check on over-irrigation which does not exist when water is brought without consulting them and laid on their fields without any effort on their part. Consequently when sub-soil water is sweet, plentiful and at a workable distance from the surface, nothing more is advisable than to encourage the cultivators by easy grants of *takavi* to dig wells. Unfortunately these conditions are often absent.

14. I think the interest on works of improvement as distinct from mere "agricultural loans" should be reduced to 3 per cent., i.e., 4 annas per month. Whatever may be the case in some other parts of India, it is certain that in most of Gujarat in ordinary times the *Savkar* will lend for a sound improvement, such as a well, at 8 annas per month, i.e., six per cent. per annum plus a small commission on "opening his bag." On loans for seed, buying cattle, subsistence of the cultivator, etc., he will of course demand more, and there is not the slightest reason why Government should not do so also and keep to their present rate.

15. I do not think the method of distributing *takavi* for permanent irrigational works needs any further simplification. Small loans for *kachcha* wells and for seed, etc., do not come within the scope of this discussion and should not, in my opinion, be given at all by Government except (1) in time of famine, or (2) to backward races whom it is desired to free from serfdom to the *savkar*. It may be well that the officer distributing for these purposes should be able to carry money with him on tour and pay it out without any circumlocution. But in this Division the practice for larger loans is for the applicant to present himself once before the Mamladar to ask for the money and again after the report by the "Village Panchayat" to receive it. These visits to the Taluka Headquarters are not regarded by the people as in any sense a hardship and are of positive advantage as marking the gravity of the transaction. A man who really means to make a well will give himself much more trouble than that to interview the brick-maker or the mason, or, when need be, the *savkar*.

16. Herein lies the crux of the *takavi* system. The cautious landholder is unwilling to make himself liable to yearly payments which he knows will be enforced with regularity, even, for all he knows, to the forfeiture of his lands. It is not merely the chance of a bad year for he may hope for lenience on account of that. If a death or marriage takes place in his house and sweeps off all his ready money the *savkar* will make allowance, but not so Government. Hence he hesitates. On more than one occasion I have lately been told by villagers that before taking large sums to build wells they intend waiting to see how it fares with those who borrowed from Government during the famine. The difficulty is not an easy one to meet, for of course a loan for a remunerative work must be recovered on business-like terms, and any attempt through the village officers to take account, as a *savkar* does, of a man's private circumstances would only result in unbridled corruption. A general concession, I would suggest, is the recovery by easier instalments than have hitherto been usual. The life of a well being from 50 to 100 years or more, there is no reason why repayment should not be spread over 20 years or more. This would not be felt by a vigorous man. The smallness and the definiteness of the demands combined with freedom from dunning between-times would be realized by all as great advantages.

17. The worst contingency of all is that the well, being dug, may turn out a failure. Only yesterday I met a man in Sahijpur (Dholka taluka) who by all accounts

spent and lost Rs. 500 in this way last year. He had called in a Brahmin "Joshi" of local repute who professed to find water with wand and incantations, but only succeeded in finding salt water. This morning I saw a well (in the Kaira district) which had first of all been dug and steyned to the depth of 20 cubits, giving sweet water. The supply ran short and digging was continued with the usual wooden ring, 10 cubits at a time, until a plentiful spring was reached at about 50 cubits from surface of ground. This was good to the taste, but after a year's trial turned out to be "chopdu", that is, its effect was to bind the soil together like glue and eventually stop all growth. The result is that the well on which nearly Rs. 1,000 has been spent lies unused and useless. The unfortunate owner told me with tears in his eyes that he had borrowed all the money in 1954 (A.D. 1897-98) from a *savkar* at 6 per cent. and had nothing to show for his enterprise but the debt. Many wells, especially in favoured tracts, give a sweet and full supply at 20 or 40 feet from surface. Some give none at all within a reasonable depth. Some are salt from the beginning. Some are sufficiently sweet for one watering but not for more, and these are of some use for rice cultivation. Some are good for one season and then must be unused for two or three. Some most disappointing of all are sweet for a year or two and then gradually turn salt.

18. The question is, can the people be assisted to meet these freaks of fortune? The use of boring tools (Shaeda) good down to 30 feet or so, is known to the people in many parts, and two or three are being placed at Government expense this year in various talukas for free loan. I am not, however, sanguine of much result. Either they will not find favour for want of expert direction, or being roughly and carelessly used they will soon get broken. Private blacksmiths have already begun to supply them on daily hire, and in ordinary times it would seem better not to interfere in the business. The use of these shallow-boring tools will not however always or often prevent loss, for permanent sweet-water is not often struck within 30 feet, and in most soils the steyning has to be put in before that depth is reached. I notice below the suggestion that deeper boring under trained men should be carried on in tracts where the upper water-bearing strata are salt and it might be arranged that these parties may bore in the land of any holder who is willing to pay the whole or, say, the half of their expenses, or, better still, a fixed fee. Cases in which the water is not salt but "chopdu" are much more rare. At present the cultivator has to wait for a round of seasons before he can detect the fault. The Agricultural Department should have at its service a laboratory where all such points can be settled at once for a small fee. Few of the people would resort to it at first, for they would have little trust in its verdict. The sooner a beginning is made the sooner such agencies will justify themselves. With the spread of education leaflets to inform the cultivator what is being done and what is possible to him would be useful. Ultimately he would only have to get a boring made, deep or shallow, as may be indicated by the general water level of the country and get a sample tested both for merits and defects, though even then he would have to take the risk of the water subsequently turning salt.

19. It has been suggested that remission of *takavi* should be given in every case of failure. There is much to be said for this proposal but also many objections. It would lead to many and varied attempts at fraud which could only be guarded against by thorough enquiries which the already overburdened staff have little time to make. The Collector might be given power to make remissions in hard cases, but this half and half solution would also be objectionable. A definite promise on which a claim can be based is necessary to produce full effect and also to exclude favouritism and intrigue. On the whole I do not see how Government can safely take upon their shoulders the risk of failure and am not very sure it would be desirable to do so if they could I would prefer to minimize the risk by expedients noted above and below—paragraphs 18 and 21.

20. It has been suggested that Government should go still farther than this and under Government agency take the construction of wells on a wholesale scale. I am entirely opposed to this. It would be a serious advance on a wrong line—the line of doing for the people what they can do for themselves. If we build their wells we may as well build their houses. An experienced cultivator can judge better than any Government agency whether it will pay or not to make a well in a particular field. If he undertakes the risk and trouble it is the best guarantee we can get that the position is suitable, i.e.,

near the village, that the soil is suitable that manure is available, that water is likely to be struck. He is much more likely to be right on these points than a Government officer whose only interest in the matter is to show a return of work executed. Granting however for the moment that the latter is as good a judge as the former, the next question will be, who is to pay for the work? If Government is to pay, every one will want the free gift and have an equal right to it and very few will be able to get it. Those would have to be excluded whose sub-soil water was indifferent or who could not use a well for want of manure or would not for laziness (there are many such). In the weeding out of such holders bribery would be rampant, but even if they were fairly eliminated it cannot be seriously contended that the remaining lucky ones should be supplied with a well at the expense of the State. Yet the cost could not be charged on them either in lump or by enhancement of the assessment at the expiry of the guaranteed term without their consent, and no man in his senses would give his consent to have his work done by the Public Works Department. Not only would it be twice as expensive as if done by himself, but no man would willingly bring about his place a gang of subordinate officials with their impertinent swagger and hard and fast rules when he could get the work done by his own people whose interest it would be to conciliate him and meet his wishes. The number of wells already in the country that lie unused is remarkable, either because of the badness of the water or because of the laziness of the owner or his want of means in the shape of tackle, bullocks, manure, dependants to help, watchmen to protect the valuable crop. The result of a system of Government well-digging would probably be to greatly increase these unfruitful assets. "Three acres and a cow" may be the ideal of rustic prosperity in England, but "three acres and a well" is by no means its equivalent in India, though popular writers often argue as if it was.

21. There are tracts where the surface water is sweet and scanty but where the people will on no account go deeper from a well-grounded fear of striking on brackish springs. In

others there is not even an upper supply of sweet water. As things at present stand, unless there is an adjacent river there is nothing possible in such tracts except perhaps a canal like that proposed from the Sabarmati. There are however indications which give some hope that in places deeper water still, free from salt, with a head upon it, may be struck by deep boring which should be systematically undertaken. In Broach town there is a well in which from a depth of more than 100 feet the water rises of itself to above the river level. In Virangam town, if my local informants are correct, a pipe was driven down below the brackish water and after it had tapped a lower and sweet spring was broken, but a jet of sweet water still welled up 2 or 3 feet above the top end of the pipe. It was in this line of country that Mr. Griesbach recommended trial borings for an artesian well. Deep boring parties for special areas should be organized, each under a supervisor who should be a skilled mechanic. They should operate wherever the general results are likely to be most instructive, but they should be free to bore in a private holder's land on terms as suggested above.

22. It is not irrelevant to mention that in this province at all events the beneficial results of irrigation depend directly on supply of manure. In the best villages that is the real check on the increase of wells, for no shrewd cultivator will spend money upon water unless he can make sure of keeping up the fertility of his land. It is surprising how little has been done to lead the cultivator to exercise economy and resource in this matter. The need has become greater than ever here since the famine reduced the cattle by 70 per cent. Mr. P. K. Subbiah's note on "Different systems of housing cattle and conserving manure" published as an "Agricultural Ledger" is being translated into Gujarati and, if approved by Government, should be circulated to every village. There are few now which do not contain some cultivators who can read and write, and much good might be done by the dissemination of useful agricultural information in vernacular leaflets. That however is wandering beyond the scope of this note.

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1. Q. (The President).—How long have you been Commissioner of the Northern Division?—About 5 years.

2. Q. Were you here all through the famine?—Yes.

3. Q. You have submitted a very interesting memorandum. The opening paragraph as regards the silting up of the mouths of these rivers reveals a very serious matter and one that should be investigated?—Yes, it is a very serious matter indeed.

4. Q. You say in paragraph 3, "In the sandy soil of Parantij taluka the Hathmati Canal has been a failure because among other reasons, the loss in the channel by percolation is enormous and because the rice beds will not hold water without great wastage"?—Yes, the country is not suited to rice cultivation.

5. Q. Is it not worth while using the water for wheat and barley?—Undoubtedly; it is used, when they can get water in the cold weather.

6. Q. I gather from the note sent in by Mr. Beale that measures have been taken to prevent the loss from the Canal; assuming that this is effective, would the canal then be a success, if the water did its full measure of work?—I should not like to speak definitely. My impression is that the result has been already to deteriorate a good deal of the land by efflorescence and the general complaint of the villagers also is that the land is getting exhausted because their supply of manure is not sufficient; the water being brought to their doors tempts them to over-water and over-crop the fields.

7. Q. Is the efflorescence on the increase?—Yes.

8. Q. Did it not exist before the Canals were started?—I cannot say, it probably did.

9. Q. You say in paragraph 4 "The only tracts where a canal supply would be welcomed by the people are adapted for rice fields, the land being mixed more or less with loam." Is there any part in Gujarat answering to these conditions where it is likely that canal irrigation can be introduced?—That would be more or less the line the Sabarmati canal is supposed to take, whether it is desirable or not is a question; it would lead to the people growing a second crop that would be chiefly regulated by the supply of manure; there is no doubt they would grow barley and wheat.

10. Q. You say the canals are broken reeds, for the water fails in time of need; would it be worth the cost to have a thorough survey made of the catchment basins to the north of this District, to see whether it was possible to store water?—Yes, especially in the Panch Mahals.

11. Q. The best plan would be to have the catchment basins exhaustively examined?—Yes, certainly.

12. Q. We were assured that brackish water was very good for barley?—Yes, if it is not too brackish; and it is not bad for wheat.

13. Q. Mr. Mollison says it is to be recommended for tobacco?—Yes, particular salts.

14. Q. You say in paragraph 7, "I have only to suggest that preference given to people who contribute 10 per cent. of the cost should be abrogated. This would leave the Public Works Department entirely free to take up systematically groups of tanks year by year which will tend to economy and thoroughness." I thought that the Public Works Department, quite apart from this rule, takes up any tank needing repairs?—A certain amount of expenditure goes on, and as those who pay 10 per cent. have the preference, the others are more or less out of it.

15. Q. It seems to me a little hard that if villages are willing to contribute a share that that willingness should not be taken as an indication that their necessity is great and that preference should not be given to them?—That simply means that they are ready to pay more than is due from them rather than not get it at all.

16. Q. Do you think there is a moral obligation on the State to keep these tanks in order?—Yes.

17. Q. I believe that when the last Revenue Settlement was made they were in such bad order that the Settlement was made low in consequence. If the cultivator found he could not irrigate from a tank and he asked for a remission, would it be given to him?—Yes, the landholder often abstains from asking for a remission, believing that if he gets it, it will mean surrendering his rights.

18. Q. We heard that there are 1,200 tanks in Ahmadabad?—Yes.

19. Q. Would it be possible to fix a certain limit for those that Government declines to repair and make a remission if no repairs are made?—That is already done.

Mr. Lely. 20. Q. And the assessment remitted?—We remit the assessment if we are asked to.

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21. Q. With reference to what you say about sluices and bunds in paragraph 11, this refers merely to using the broad channel of the river?—Yes.

22. Q. Can you quote a case?—Yes. Colonel Prescott who was a very experienced officer here 30 or 40 years ago strongly recommended that a great deal might be done on the River Sheri by making bunds, but that is a point that requires very careful examination, it is the common belief that the water is "chapadoo" (creates a caky soil).

23. Q. We were told yesterday that Sowass declined to lend money for the construction of wells?—I don't at all believe that they won't lend money for wells in ordinary times.

24. Q. It was said that the *bania* would not lend a large sum?—He would lend money if he was sure it was being properly used; as a matter of fact no rayat can dig a well without help from the *bania* unless he gets takavi from Government. If a *bania* is satisfied that the money is going to be properly spent he will lend it.

25. Q. I gather that you do not think there is any material inconvenience caused by delays in granting advances?—No.

26. Q. We heard yesterday that there was sometimes five and six months delay?—That would be exceptional, I think. It depends upon the personality of the officer concerned; there need be no great delay.

27. Q. Do you think it would be a popular measure and an expedient one instead of giving advances, merely, to give the money and assess wet rates in future?—I should think it would be accepted with reasonable arrangements, but a man would sooner have the well his own property.

28. Q. It would be his own property all the same?—As long as there is assessment he thinks it is likely to be increased.

29. Q. You suggest the reduction of the rate of interest to 3 per cent., would it stimulate the construction of wells largely if Government were to give it free of interest altogether?—Yes, I think it would.

30. Q. As a famine protective measure?—Yes, I should think so.

31. Q. If it was given out on these terms for the next ten years or something of that sort?—The Government made a similar concession on takavi advances during the time of famine and it was very much appreciated.

32. Q. The moral effect would be good?—Yes.

33. Q. You think that one cannot go wrong in multiplying good wells?—Not if the people have the construction in their own hands.

34. Q. You say in paragraph 16 "A general concession I would suggest is to recover by easier instalments than have hitherto been usual" and that "repayment should be spread over 20 years or more." I understand the law allows 20 years?—I don't think the practice is so.

35. Q. What is the practice?—It depends upon the idiosyncrasy of the Collector, I think it ordinarily is not more than 10 to 12 years.

36. Q. You on the whole recommend that remission on takavi should be given in every case of the failure of a well?—No, it is a very doubtful point.

37. Q. Supposing a man came to the Collector and applied for assistance in boring and it was given; if that well turned out a failure I suppose you would help the man then?—Yes.

38. Q. On the whole what measures on the part of Government do you think advisable to protect this Province of Gujarat and to make it more fit to withstand famine?—I don't think anything heroic is possible; there are many useful minor measures; I should thoroughly prospect the Dohad taluka of the Panch Mahals, then, I would advocate the construction of bunds in rivers; of course the ancient system of tanks for assisting rice cultivation should be kept in perfect order; lastly, I should develop wells as freely as possible.

39. Q. Turning to the question of relief in famine, what is the best form of work?—Digging, certainly.

40. Q. Would you employ famine labour on small tanks?—Yes, because there is really nothing else.

41. Q. We have heard in some places of long earthen dykes placed across the country to intercept the water,

would you recommend that sort of work?—They would only be possible in certain localities, e.g., to intercept the flood water in the central and western parts of Ahmadabad. I don't think it would be possible on any large scale owing to the conformation of the country.

42. Q. We have had some evidence regarding the water-logging of certain districts and were told that in some places drains are looked upon with suspicion?—Undoubtedly a drain is a great boon in some years and a great curse in others.

43. Q. We have heard the objection to a drain that it flows too fast and washes off the good soil?—That is so.

44. Q. Do you consider these drains a good form of famine-relief work?—Certainly, most excellent.

45. Q. The famine work programme is got up, I understand, by the Executive Engineer in consultation with the Collectors; does it come officially before you?—Yes.

46. Q. Is it being kept up pretty well in these parts?—Yes, I have a complete programme.

47. Q. Is there any rule observed as regards half-yearly or annual revision?—Yes, they are sent in annually to be revised.

48. Q. (Mr. Higham.)—We have heard a good deal about the drought in these parts, but does it ever happen that land is damaged by excessive floods?—Yes, before the great famine in 1899-1900 there was more damage by flood than by drought.

49. Q. That is to say rivers overflowing their banks?—Yes, in 1875 the Sabarmati overflowed and did enormous damage, destroying valuable land. The country has not recovered from it yet.

50. Q. What was the effect of that flood?—It overlaid the good soil with sand.

51. Q. Does it draw up the salt?—No, it does not lie long enough for that, it runs over the country.

52. Q. The only damage is the sand?—Yes.

53. Q. If the country is thoroughly saturated by a flood of that sort, does it have any effect on the wells?—A great many wells got thrown out of use; they got silted up.

54. Q. They have not become saline?—No.

55. Q. Is there salt efflorescence?—Not that I am aware of; the flood comes and goes very quickly.

56. Q. In any proposal for putting wells across the rivers these high floods would have to be considered?—Undoubtedly.

57. Q. In paragraph 5 you speak of the "danger that projects may be adopted, as were those of the Hathmati and the Tapti canals, on engineering rather than agricultural considerations"?—Yes, I don't think from an agricultural point of view the Tapti canal is a very promising scheme.

58. Q. Is it not now being reconsidered?—Not that I am aware of.

59. Q. I think the Bombay Government was asked to consider the question, you have heard nothing about it?—No.

60. Q. Am I to understand that on small or 'one man' tanks the water assessment has been taken off?—The Government does not take the initiative; if the people apply an enquiry is made, and if they do not get water we remit the assessment; if they get a water-supply the assessment remains, even if Government have no intention of keeping them in repair.

61. Q. In case it was necessary to employ relief labour, would it be suitably employed on small tanks?—It might, but at most would not give very much labour.

62. Q. I mean village labour?—Yes, no doubt, many have been repaired.

63. Q. Are they entered in the programme?—Yes, the small ones are clubbed together in one item.

64. Q. You say in paragraph 6 that tanks are never in use for rabi irrigation, because they are very shallow and dry up at the time when water is wanted; if the tanks were deepened so as to hold more water would the people lift water out for the rabi crops?—I am afraid not, some of the more energetic might.

65. Q. The cost would be more than they are willing to incur?—Yes.

66. Q. You say in paragraph 12 that steam pumps on rivers should be encouraged by Government by imposing reasonable and uniform conditions, is it necessary to impose any conditions at all?—It is a matter in which Government as general landlord may impose some conditions.

67. Q. Would Government have any *locus standi* in imposing conditions?—Yes, as proprietor of the water of the river.

68. Q. The Government is not the exclusive owner of the river, is it?—I should say so.

69. Q. As regards the Sabarmati canal, you don't seem to be very strongly in favour of it?—No, I would only strongly advocate it in a year when we were very hard up when it might be worth trying.

70. Q. Do you not think it would have any protective value?—I doubt if the value would be commensurate with the cost.

71. Q. (Mr. Ibbetson.)—I gather that you don't agree with the opinion which has been expressed in the papers by some of the witnesses that famine is so rare in Gujarat that it is not worth while spending money to protect the Province?—No.

72. Q. When was the last great famine?—In 1813.

73. Q. How long have you been in Gujarat?—Thirty years.

74. Q. Within that 30 years has there been anything like severe distress or scarcity of any sort short of famine?—No, there has never been any need of relief works until the recent famine, there were a few works in the Panch Mahals in one year.

75. Q. Can you tell us anything of the period between 1813 and the time over which your experience extends; anything about the previous 60 years?—I should not like you to take my information as exact, but there have been years of scarcity.

76. Q. Was there no distress in 1877?—Yes, there was local distress, in the district of Broach especially; the crops failed locally owing to attacks of grass-hoppers; it was a terrible year in the Deccan but not in Gujarat, and there was local famine about 15 years before that.

77. Q. So that we have had three famines in the country owing to drought in which there has been no need for relief works in Gujarat?—Yes.

78. Q. Speaking of the Hathmati canal, there seem to be two complaints—

(1) the rice beds will not hold water;

(2) the supply of manure is limited;

supposing it was possible to substitute rabi for rice, would not that meet both difficulties, rabi requires less water than rice?—I don't think that anything practical is possible. The cultivator would never be induced to believe in it. He would have no confidence in the supply of water holding out for the rabi. I think myself that it might be an advantage.

79. Q. In regard to the moral obligation of Government to clear the tanks; we were told yesterday that at the revision of settlement the state of repair, in which each tank was, was taken into account and the assessment was lowered in consequence, and we understood the argument to be that that removed the obligation of Government to clear the tanks; do you agree with that?—Yes, as regards land which received no water at the time of the revision of settlement.

80. Q. If Government now spends money on these tanks and restores them to their original condition it might fairly take additional assessment on account of the improvement on the land already assessed?—If it gives a better supply.

81. Q. You have said that if 100 acres are under the tank the first land to suffer by the insufficient supply is the more distant land which loses its irrigation altogether and that the assessment on this is reduced but not that on the nearer lands. The reduction is on the area irrigated, not on the quality of the supply?—Yes; the result of clearing the tanks would be to water the more distant lands which should be assessed again, within the time of settlement.

82. Q. Have you had many applications for a reduction of assessment on the grounds that the tank is out of repair and the supply of water insufficient?—Applications of that kind don't come to me, but as Collector I remember they used to come in.

83. Q. Do you think that the number of such tanks bears a substantial proportion to the number of tanks which are filled?—A great number of people don't get water who have to pay for it; they believe that the tanks will be repaired sooner or later and that by obtaining a reduction of assessment they would surrender their rights

to the water. There is another reason, and that is that the water rate is included in the consolidated assessment, and they don't realize that they pay for the water.

84. Q. In the case of very small tanks, if Government has decided not to repair them and was prepared to remit the water assessment would it be possible to get the people to keep them?—It would be difficult to get them to combine.

85. Q. Seeing that Government is not prepared to do the work and that the people cannot, would Local Boards be a possible agency. Supposing Government were to allow Local Boards to take the wet assessment that may fairly be assessed on the land, and so put them in funds, could not anything be done?—I should not advise it; they are the worst agency you could have.

86. Q. You don't hope much from them, even supposing that the money difficulty is got over?—No, I should be inclined rather to trust to the agency of the people.

87. Q. Do you think the people might be induced to make small tanks?—They might, but there would be a difficulty in obtaining land for the tanks.

88. Q. You say in paragraph 5 "I am myself of opinion that as a rule enough is not credited to water". Do you know what the system of credit is?—It is a mere survey question; I don't think it is of much practical account; the assessments are consolidated, the separate assessment for water does not appear in village records.

89. Q. Is it not important that Government should know exactly what it gains by the tanks?—Yes; I think it is generally under-estimated.

90. Q. What is your opinion based upon?—I understand the general principle is that the heavier the rainfall of the country the higher the water-rate; in Konkan I believe the soil rate and water rate are equal. Here, in Gujarat, where there is less rainfall the water-rate is considerably less as a rule than the soil rate.

91. Q. You think it should bear a larger proportion?—Yes, the amount credited to the water should correspond more or less to the net produce of irrigated as compared with that of dry lands.

92. Q. Your opinion founded upon experience is that that is not the case?—Yes.

93. Q. Do you think the error is in the direction of crediting too little to water?—Yes.

94. Q. (Mr. Muir-Mackenzie.) The scarcity or abundance of rainfall is not a legitimate ground for a higher rate?—Not, if it is fully replaced by artificial watering; it does not matter to a man whether he gets his water from a tank or the heavens. I would credit as much to the tanks in Ahmadabad as to the heavenly supply in the Konkan.

95. Q. (Mr. Ibbetson.)—Would you extend the number of tanks largely?—No, I don't think I should; in proposing a survey I had in view storage tanks. I would not increase the number of irrigation tanks.

96. Q. By irrigation tanks you only refer to one that holds enough water for rice?—Yes.

97. Q. Would you advocate large storage tanks?—Yes; where they are possible.

98. Q. Do you think they would pay—as a mere financial question?—They would not pay to begin with; not in the Panch Mahals certainly as the people are not accustomed to irrigation, they would soon learn it, there is a great market for rice in the Panch Mahals.

99. Q. (The President.)—They might be carried on as famine relief works?—Yes.

100. Q. (Mr. Ibbetson.)—In Gujarat have they had any appreciable effect on the wells?—Yes.

101. Q. Such an effect as to materially increase their yield?—Yes.

102. Q. Supposing Government were to make a large tank in a tract in which there were wells, apart from the actual irrigation from the tank, would it exercise a material effect upon the prosperity of the tract through the wells?—Certainly; tanks sweeten the brackish water of the wells in Gujarat, and in this way do increase the prosperity of certain tracts.

103. Q. Would not the tanks be entitled to some credit in consideration of that improvement?—I'm afraid that it would be difficult to estimate the amount; there would be no many shades of effect.

104. Q. It has never been done?—No.

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105. Q. As to e.g.s, what estimate did you form of their protective value in the late famine; how did they work?—As a matter of fact they were very disappointing; in the cold weather of the famine year they were immensely extended, but the crops were very poor, owing, the people said, to the ground not having been rained upon.

106. Q. Their protective value was not very great?—No.

107. Q. Does their supply decrease year by year in the case of prolonged drought?—Yes.

108. Q. Were they very disappointing this year?—The rabi crop promises rather well; but as the water-supply in the wells is much shorter, the area will be smaller.

109. Q. On the whole they do afford a substantial amount of protection?—Yes, especially as regards fodder.

110. Q. Apart from the takavi question, have you any suggestions to make as to the means of stimulating the construction of wells by the people?—I don't know of any means except takavi.

111. Q. As regards the rule of exemption from assessment I am anxious to get your views; it is of great importance to know how it works, we have been told that the people themselves have a certain amount of want of confidence in it; what is your experience, do you think that is so?—No, I should say not; I don't think the whole of the population thoroughly understands the intentions of Government, but they are gradually learning to understand.

112. Q. Would a cultivator who had made a well and whose rate was enhanced on account of a rise in prices realize that the enhancement was not due to the well?—Yes, I think so; his neighbour who had not made a well would also have his rate enhanced.

113. Q. Do you think that as a rule Government does arrive at the one object of exemption—the stimulation of private enterprise?—Yes.

114. Q. How long has this policy been at work?—It was legally established on the revision of the Code in 1886, I think.

115. Q. (Mr. Muir-Mackenzie.)—Was it not working before that?—It was then made plain in chapter and verse; I should be inclined to date it from 1886.

116. Q. (Mr. Ibbetson.)—Do you think the people's knowledge of the principle might date from 1886?—Yes.

117. Q. Do you think the number of wells has increased much more rapidly since 1886, apart from famine years?—I cannot say one way or the other, in any case 15 years is a short time.

118. Q. Can you tell us any facts in support of your statement regarding the stimulation of private enterprise owing to exemption?—I cannot say. I have no statistics.

119. Q. As regards the effect on the ordinary rayat, do you think that he would make a well on promise of permanent exemption, when he would not make a well on promise of exemption for 30 or 40 years?—I think it would make a great deal of difference.

[Mr. Muir-Mackenzie read out figures relating to wells in Gujarat and stated that from 1886-87 to 1896-97 there had been a very small increase.]

120. Q. Now in regard to the question of recommending certain leniencies and liberalities in order to stimulate the construction of wells, such as the reduction of interest on loans and remission of advances some of which you yourself suggest, the cost of these must of course come out of the public purse. In Northern India we can recommend them on the ground that although for a time Government will lose money, still if extra wells are made after a period of exemption there will be a financial return in the shape of enhancement of direct revenue; in Bombay where the exemption is permanent there is no such prospect; whatever is given is lost for ever; and except as regards the general prosperity of the country there is no financial return?—No, there is a considerable return to the rayat, though not to Government.

121. Q. If you make the rayat a present of the interest on a loan of Rs. 1,000, you take it out of the pockets of the people of the rest of India. What I wish to point out is that in one case you get a return but not in the other, and that where the exemption is permanent it becomes more difficult to support the measures of leniency which you recommend. Take a province in which the term of exemption is limited, say, to 30 or 40 years; would you have the exemption permanent or would you grant the more favourable terms as regards interest and remissions; which concession do you

think would have the greater effect in stimulating private enterprise?—Why not both?

122. Q. If you could get both, the question is in which way we should be more likely to stimulate private enterprise in such a province; whether by the proposed measures of leniency or by changing the 30 or 40 years exemption into a permanent exemption?—It would depend much on the view of the individual landholder. We might give him the choice between making his well with aid from Government liberally given with exemptions for a limited term, and making it without aid from Government with permanent exemption.

123. Q. Do you think a reduction from 5 to 3 per cent. interest on takavi would actually induce a rayat to make wells?—I think it would be a strong inducement.

124. Q. Would it induce him to make wells when he would not ordinarily make them?—Yes.

125. Q. Your well protects (not very effectually) 2 to 4 acres in one year of drought out of 30, is it worth the while of Government to purchase that amount of protection by remitting the interest on takavi loans for wells?—The protection in a famine year does not represent the total benefit by any means.

126. Q. You think it would be worth while on the whole?—Yes.

127. Q. You say in Gujarat a *bania* will lend money for wells at 6 per cent.?—Yes, to a good substantial rayat.

128. Q. (Mr. Muir-Mackenzie.)—Would he do it in any district?—It would be done in Surat. I don't doubt it would be done in Broach; I am speaking of pre-famine years; the security here is more valuable than in the Deccan.

129. Q. It is not restricted to the *patudars*?—It is restricted to a man of repute in the village.

130. Q. To large land-holders?—Not necessarily, it would depend upon the character of the man.

131. Q. Would a man holding not more than 10 acres have any chance?—If he is otherwise a man of trust there would be no difficulty in his getting it; sometimes a *bania* goes shares in the well.

132. Q. (Mr. Ibbetson.)—You recommend recovery of loans by 20 instalments; it has been proposed in some quarters to allow 50?—I think that would be too much.

133. Q. Would not the risk of the well failing, or turning salt or falling in be a substantial danger to Government if it increased the number of annual instalments to 50; the longer the period of payment, the greater the risks?—I don't think it would be worth while to prolong the agony beyond 20 years.

134. Q. You lay considerable stress upon the rigidity of recovery, do your rules allow the postponement of instalments?—Yes.

135. Q. Are the rules acted upon?—Yes, it mainly depends upon the good word of the village accountant.

136. Q. Can you suggest any way in which this rigidity could be tempered?—Nothing, except by making the instalments so small that they would not be felt.

137. Q. We find complaints that the delay in granting takavi caused by enquiries as to solvency, etc., is one of the serious objections of our system; are such enquiries necessary seeing that by law the loan is the first charge upon the land?—Yes, I think they are; Government certainly have the right to supersede the *bania*, but I doubt it would be wise or just.

138. Q. You say that you hesitate to recommend a remission where the well falls in; supposing we only gave remissions where a well was constructed on a site approved by Government?—I don't think that would work.

139. Q. Supposing that we had approved of a site after a trial boring and that the well failed?—Then there would be good reasons for giving a remission, but I think that would be extremely rare.

140. Q. There is another suggestion that Government might only remit a portion of the advances?—I should object to that, as there would be a question of how much it should be.

141. Q. Does the absence of any tenancy right prevent tenants from making bunds, etc.?—The tenants don't lay out money on the land.

142. Q. Would not the old owners do it?—If they are protected they do sometimes.

143. Q. You don't think that the absence of protection operates so as to restrict extension?—No.

144. Q. (*Mr. Rajaratna Mdlr.*)—In reply to a question by Mr. Ibbetson, you said that there was in the case of most of the tanks a surrender of assessment at the revised settlement and consequently the moral obligation on the part of Government to keep up these tanks has been removed or lessened; so far as regards those lands which are still assessed as wet, is any reduction made in case the tank fails?—Upon application of the holder enquiry is made and if the tank is found to have failed the assessment is proportionately reduced.

145. Q. What amount has been spent on the repair of tanks during the past 15 or 20 years?—I cannot tell you.

146. Q. The number of wells in your division has not very largely increased?—No, I believe not.

147. Q. Might it be due to the present complicated system of inquiry regarding loans?—It might be due to some extent to the complexities of the system, unavoidably so, as we must be sure of some security. I don't see why there should be any undue delay at all; we are now beginning a new epoch in regard to takavi for which there was no demand before the famine; we ought to see a new development during the next few years; the system seems to be as simple as it can very well be made; a man asks for money, you make a reference to the village officers and if the enquiry is satisfactory he gets it.

148. Q. How long does it take?—It need not take a month; sometimes it is the man's own fault; people have a habit of going the last day and expecting the whole thing to be done in 24 hours.

149. Q. You said you are not in favour of granting remission of takavi; if special cases are enquired into by Divisional officer would you still refuse to grant a remission if he is satisfied that there has been no fraud and that the rayat honestly spent the money?—I have a horror of special cases myself.

150. Q. Do you think the Collector could make the enquiry?—The Collector is a very hard worked man, cases for special treatment would be very frequent once that was laid down.

151. Q. At the end of paragraph 13 you say "these conditions are often absent." You don't refer to any difficulties in takavi?—No.

152. Q. With reference to what you say in paragraph 15 is there at present anything to prevent an officer carrying the money and paying it on the spot?—It is not a desirable thing to carry large sums of money about on account of the fear of theft.

153. Q. Is there anything in the present rules to prevent an officer doing so?—No, except that there would be accounts difficulties. I don't say they cannot be overcome.

154. Q. Have there been many cases in which takavi, or a portion of it, has been remitted owing to failure of wells?—Not that I am aware of.

155. Q. You say in paragraph 20: "the number of wells already in the country that lie unused is remarkable"; are there any statistics to show the number of wells unused?—I am not aware if there are any.

156. Q. (*Mr. Muir-Mackenzie*)—Is there any reason to believe that the water-logging which has been observed in certain areas has been proceeding more rapidly in recent years?—That is my impression. I cannot give any very definite grounds for it.

157. Q. In your long experience of Gujarat do you know whether there has been a large extension of water-logging?—Yes, we have heard a great deal more of it in recent years, especially in the Matar Taluka.

158. Q. You attribute that to the silting up of the rivers?—Yes, chiefly the Sabarmati; it has become very much silted up during the past fifteen years.

159. Q. I understand from your memo. on the Ankleshvar report that you fear the silt would beat all efforts to drain it?—Yes.

160. Q. But do you think that the drains which have been made have not even temporarily mitigated the evil?—I have no doubt they have temporarily mitigated the evil.

161. Q. Are you able to say whether it would be a long time before the effect of the drains would be neutralized?—It would be some time but not very long.

162. Q. Have you seen any of these lands in which surface soils have been injured by drains?—No, I have heard of them.

163. Q. You cannot say whether the injury extends over a large portion or the whole of the drain?—I cannot say. *Mr. Lely.*
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164. Q. Do you consider that the rayats are likely to take up considerable sums as advances on their joint responsibility for the purpose of digging tanks or improving old tanks?—No, I have never seen any signs of it.

165. Q. You don't think the people are good judges as to sites of tanks?—No.

166. Q. Would they make greater mistakes than as regards wells?—They would be much less excusable mistakes.

167. Q. I thought you said they were good judges as regard wells?—Yes, they are good judges, but not as good in the matter of tanks.

168. Q. You say in paragraph 3 "the people would certainly not take canal water in the black soil country between the Tapti and the Mahi rivers or in the west of the Ahmadabad district. It would also be superfluous in land so retentive of moisture." Would it be superfluous in a year of drought?—No; in such a year as this it would be superfluous.

169. Q. What about 1899?—Of course that was different; it would be superfluous this year when the cotton would have done excellently had it not been for rats.

170. Q. Would it not pay to substitute rice for cotton cultivation?—I don't think you would gain anything by that.

171. Q. Does rice not pay better than cotton?—It may; but I don't think you would gain anything by substituting rice for cotton, they are both valuable crops.

172. Q. On the other hand there would be this advantage that canal water would be available in a year of extreme drought without any loss to the people?—Yes, no doubt the question is whether it would be a gain to Government in ordinary years.

173. Q. If rice is more valuable?—It is fully as valuable.

174. Q. It might pay a moderate rate?—In an average year rice is grown on the understanding that there will be enough rain to mature it.

175. Q. Still, tanks are a good protection?—Tanks are chiefly intended for years in which the rains fail, but I don't think the rayat would pay Rs. 7 for a last watering; it is a question I have discussed with men who ought to know what the rayat would be willing to pay for extra water from the canal. Some say he would take water from the canal in any case. I should not have thought so myself.

176. Q. It is admitted that salt water is useful for certain crops, such as barley?—Yes.

177. Q. It was said yesterday that in certain barley tracts it might be dangerous to sweeten wells?—I should not be inclined to go so far.

178. Q. You say in paragraph 6 speaking of irrigation tanks "their necessity is based on the fact that in probably 3 years out of 5 the early rainfall suffices for sowing, transplanting and bringing the rice plants forward, but fails at the last when water is needed to mature them." Is it to be inferred from this statement that in 3 years out of 5 rice is an utter failure?—Perhaps 2 years out of 5 would be safer; in 2 years out of 5 rice crops not protected by tanks are a failure.

179. Q. Rao Bahadur Bhimblai has estimated the area unprotected at two-thirds and that fails?—Yes, perhaps if a rayat could secure a good crop in 3 years out of 5 it would be enough for him.

180. Q. With regard to the repairs of tanks you would be glad to see this 10 per cent. contribution altogether abolished?—Yes.

181. Q. In a Memo. I have obtained from the Public Works Department I find that in this Division there are estimated to be 1,178 tanks requiring repair, the cost is estimated at Rs. 5,20,000, and a suggestion is before the Government that these repairs should be executed systematically throughout the period of 30 years; would that suit the case or would you prefer that the period should be materially shortened?—I should prefer 20 years; I understand that the tanks silt up in that time.

182. Q. Now that it has been definitely ascertained that these 1,178 tanks require repair, would it not be advisable in your opinion to concentrate famine labour upon these tanks?—Yes, that has always been in my mind.

183. Q. (*Mr. Ibbetson*)—Is the sum of Rs. 5,30,000 annual or spread over 30 years?

Mr. Lely.

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Mr. Muir-Mackenzie.—That is the total amount.

Witness.—I believe the reason why more has not been done is because they are small works and there is a general objection to small works?

184. Q. (Mr. Muir-Mackenzie).—The fact of their being small works would not make it impossible to take them up as works of famine administration?—It would certainly be more difficult but not impossible.

185. Q. Would it require much revision of the existing programme?—No, in the programme a number of works are clubbed together.

186. Q. With reference to what you say in paragraph 8 the whole question of remission of land revenue is under the consideration of Government, is it not?—Yes.

187. Q. Up to the last cycle of bad years do you think the people have found serious difficulty in paying their rice assessment?—It must have gone very hard with a man who lost the whole of his crops.

188. Q. Has there been any difficulty in getting it out of them?—No, his land is too valuable to risk and he could always raise the assessment from the *Sowcar*.

189. Q. With regard to what you say in paragraph 13 about wells, your general view is that only a substantial man will come forward and execute works likely to pay, but does not the general argument you have used militate against the giving of water cheap by Government, at least by the large system of canals as in Northern India?—As I understand, the canal water is laid on the ground by natural flow almost invariably, the canal rate would not be much more than the equivalent of the labour of lifting water thus saved in the case of a well the cultivator has to incur heavy expenses, quite apart from the cost of sinking, that is, bullocks and labour.

190. Q. I understand that you prefer the system under which the cultivator will get his water dear?—I look upon

that as a check against injudicious irrigation to which attach the greatest importance.

191. Q. Supposing the advantage to the land from the water to be equal, would you prefer to see land in Gujarat irrigated by wells rather than by canals?—In Gujarat certainly.

192. Q. I believe you strongly approve of the grant of takavi liberally in the early stages of famine for *kachcha* wells?—Yes.

193. Q. Would the end of October be too early if rain has failed by the end of September?—No.

194. Q. Do you think the people will again become backward in taking takavi when good years return?—I cannot say; the low rate of interest charged by the *bania* may be an obstacle; that is one argument for lowering our rate.

195. Q. You have suggested that Government should take precautions to find out whether, by boring, a well is likely to succeed; would the data collected by the Survey Department be of considerable use?—They might be of some general use, but boring on the spot is the only thing.

196. Q. Would drainage in your opinion be an effective remedy for salt efflorescence or deterioration caused by over irrigation?—I think that is the generally accepted view, I know nothing about it myself.

197. Q. You said a *bania* often supplies the capital for a well and takes a share of the produce; would it not be advantageous for Government to supply the capital for the well and take instead the *bagayat* assessment?—I don't see why that should not be done.

198. Q. You have no objection to seeing it offered?—No.

199. Q. You don't think it would create mistrust, as engendering the idea of enhanced assessment?—Not if properly managed.

WITNESS No. 21.—MR. FARDUNJI COOVERJI TARAPURVALA, C.I.E., B.A., L.C.E.

I.—Answers to Printed questions.

Mr. Tarapur-
vala.

A.—GENERAL.

Question 1. The answers below refer to the Ahmadabad District in which I have served off and on for a period of 14 years. They also cover the Khari Sluices District in Matar Taluka of Kaira Collectorate, the Khari Sluices being under the Executive Engineer, Ahmadabad District.

No. 2. The average of the rainfalls registered at Ahmadabad for the last 20 years during each month is as follows:—

	Inches.
January	0.04
February	0.09
March	0.00
April	0.02
May	0.27
June	4.59
July	12.61
August	6.70
September	4.48
October	0.38
November	0.29
December	0.04

No. 3 (1).—No.

No. 3 (2).—No.

No. 3 (4).—No.

No. 3 (5).—Yes, as regards the Khari Cut Canal, the Khari Sluices and the tanks. The obstacle does not exist in the case of wells in average years.

No. 6.—No.

Several petitions have been received during the last few years from the people of South Daskroi for the extension of the Khari Cut in Ahmadabad Collectorate and also from the people of ex-kalambandi villages in Matar Taluka of Kaira Collectorate for supply of water from the Khari. Petitions have also been received from Dholka Villages for

a canal from the Sabarmati. In several cases the petitioners have offered a free gift of land required for the canal.

B.—CANAL OF CONTINUOUS FLOW.

The Hathmati Canal and Khari Sluices fall under this head.

No. 7.—It is difficult to answer this question definitely, but roughly speaking irrigation may be said to increase the value of the produce of the land by 40 to 100 per cent. in average years from one or other of the causes enumerated in the question. In years of severe drought such as 1889 and 1901, when the supply in the canals almost completely fails, very little or no irrigation is possible.

No. 9. The water charges per acre on the Hathmati Canal are as follows:—

Crops.	Rate per acre.
Rice	3
Rabi	2
Perennial	10

The water rate on this canal is charged on the area actually irrigated.

No. 11. None to speak of. The Hathmati Canal is of 25 years' standing, and the Khari Sluices have been in operation from time immemorial. On the latter system the area of *khar* land is about 10 per cent. of the area irrigated and is not perceptibly increasing. On the Hathmati practically no land has turned salt by irrigation.

C.—CANAL OF INTERMITTENT FLOW.

No. 12. The Khari Cut is the only work falling under this head.

(1) It has got three sources of supply, viz.:—

(a) The surplus water of Khari River after satisfying the requirements of the Khari Sluices District which has, by the settlement, prior claim on the Khari River water. The surplus water is turned into the Khari Cut at Raipur by means of a weir with revolving sluices.

(b) The water from the catchment of the Chandola tank which is the principal reservoir of the Khari Cut.

(c) The surplus water of the Hathmati Canal which is brought down to the Khari through the Bhujwa Channel taking off at the 5th mile of the Hathmati Canal. The Bhujwa Channel has been recently constructed and has as yet been little availed of owing to the scanty supply of the last three years.

(2) The waters from the three sources above named are stored in the Chandola Tank and thence distributed by channels to the lands as required.

(3) July to October in years of ample or scanty rainfall; there is hardly any supply in years of drought such as 1899 and 1901.

No. 13. *Vide* answer to question No. 7.

No. 14. The value of irrigation is not much affected by the too late commencement or too early cessation of the supply, if the supply in September and October in which water is most required is ample. If the supply in those months fails, the value of irrigation is diminished in proportion to the deficiency.

No. 15. The irrigation is supplemented by well water in case of late commencement of rain and no supply in the reservoir for rice seedlings. Well water is also used to a small extent for the last one or two waterings to bring the rice crop to maturity if there is neither late rain nor sufficient supply in the reservoir. Rice is never grown by well-irrigation alone; the cost is prohibitive.

No. 17. The water rates on the Khari Cut Canals are as follows:—

	Rs.
Kharif (rice)	7 per acre.
Rabi	5 „

In case of land already assessed for water advantages at the settlement, the fixed water assessment is deducted from the above canal rate for kharif. The canal rate is invariably charged on the area actually irrigated, and remissions are given in case of failure of crops due to deficiency of canal water.

No. 19. See answer to question No. 11.

I have no experience of draining irrigated land.

No. 20. Maintenance is provided for from Imperial Funds. The average annual cost of maintenance per acre irrigated for the last ten years is about Rs. 2.58. The system works fairly well and no further legislation seems to be required.

No. 21. None that I know of.

No. 22. I do not consider it advisable to have canals made by private persons. There is hardly any scope for them in this district.

D.—TANKS.

No. 23. (1) Tanks in the Almadabad District are mostly supplied with water from their own catchments. A few are supplied by the spill from the upper tanks, while a few others are supplied with water from drainage channels.

(2) The distribution of water is arranged by the cultivators themselves under the general control of the Revenue authorities.

(3) July to October.

(4) From a few acres to nearly 500 acres.

There are in all 1,286 tanks, small and large, irrigating 26,600 acres, which gives an average of nearly 21 acres per tank.

No. 24. Please see answer to question No. 7.

No. 25. Not much if there is ample supply in the tank in September and October. The crop irrigated on tanks is invariably rice, the finer varieties of which can be sown late without much harm, but which must have a copious supply of water in September and October to bring it to maturity.

No. 26. See reply to question No. 15.

No. 28. The water rate was fixed at the settlement and is paid on the whole area assessed without reference to the area actually irrigated.

No. 30. The maintenance is provided for from Imperial Funds, the repairs being carried out by the Public

Works Department. The total amount spent in repairs during the last ten years, exclusive of famine expenditure, was Rs. 25,648 against the total assessed area of all the tanks of 26,600 acres, which gives a rate of about 1½ annas per acre per annum. A much larger amount can, however, be spent usefully on repairs. The system is managed by the Revenue Department entirely except as regards repairs.

No. 31. Silting up of tanks is remarkably slow. There are numerous tanks which have not been cleared for 50 years and upwards, and they are still in fair working order. Silt from tanks is to some extent removed by private people for manuring their fields. No dredging is required as the tanks are generally dry in the hot season. The repairs carried out to these tanks consist of strengthening and repairing the bunds rather than clearing the beds. Some of the large tanks were cleared during the last famine when the depth of silt was not found to be very great.

*Mr. Tara-
purvala.*

II.—Report on the points to be considered by the Irrigation Commission.

NOTE.—Questions which have already been answered above have been omitted in the following replies.

Point No. 2.—The following areas are protected by Government Irrigation works:—

	Acres.
Hathmati Canal	8,000
Khari Cut	3,600
Khari Sluices (Kaira District)	8,800
Tanks	26,600

As a rule rice cultivation is not possible without artificial irrigation to more or less extent.

There is ordinarily a demand for water for rice cultivation during south-west monsoon and also for sugarcane in long breaks.

The principal crops requiring irrigation are shown below:—

Crop.	Period.	No. of watering.
Rice	July to October	5 after trans- plantation in case no rain.
Wheat	November to January	7
Barley	„ „	7
Sugarcane	May to March	60
Juari	March to May	5
(Hot season.)		

The distribution on the canals is controlled by the Public Works Department and on the tanks by the cultivators themselves, subject to the general control of the Revenue authorities. The irrigation revenue on the Hathmati and Khari Cut Canals is realized in the shape of a water rate per acre of the area actually irrigated, remissions being given in case of failure due to insufficient supply in the canal. On the Khari Sluices and the tanks the irrigation rate is assimilated with the land revenue and recovered in lump for the whole area assessed without reference to area actually irrigated.

No. 3. The black soil in this district is light. Small tanks constructed in these soils hold water. There are no high earthen dams constructed, but I should say dams up to 15 feet in height can safely be constructed without a masonry core. For rice, which is almost the only crop requiring irrigation during the south-west monsoon, there is a demand for water during seasons of average rainfall as well as in case of prolonged drought. In this respect there is no appreciable difference between rice grown on black and that on other soils. They both require water in the latter part of the monsoon when the rainfall is, as a rule, meagre. There is a desire for irrigation works on the part of owners of rice lands equally whether the soil is black or *goradoo*. A number of applications with an offer to give land free of cost in some cases have been received during the last few years from cultivators in Daskroi and Matar Talukas for the extension of irrigation to their villages.

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puraia.

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No. 4. This question will be fully answered by the Superintending Engineer on special duty. I have at some length expressed my views in regard to the proposed Sabarnati Canal in my report No. 4013, dated 16th July 1901, submitted to Government when I was acting Superintending Engineer, N. D.

No. 5. There are in this district no Provincial Irrigation works, i.e., works constructed or maintained from Provincial Fund.

No. 6. *District or village works.*—These are irrigation tanks or bunds constructed in old times. Their total number is 1,286, small and large. They are controlled by the Revenue Department, except as regards repairs which are carried out by the Public Works Department. The total area assessed on these tanks is 26,000 acres. Government in their Resolution No. 34-W.I.—419, dated 5th March 1895, have admitted their responsibility to maintain these tanks, but the matter is still under consideration, as it is proposed to abandon such of the tanks as are too small or on which the water-revenue is too insignificant to make it worth while to maintain them. The average annual maintenance expenditure on these tanks during the last ten years, excluding expenditure on relief works, was Rs. 2,564. No new works of this class have been constructed of late years. Such works are not undertaken by the District Board or private landowners. I do not think it desirable or expedient that Local Funds should be expended on such works. The protective value of these works can certainly be increased by devoting more money and greater attention to their up-keep and by encouraging the construction of new bunds where feasible. Those works are generally of great value as concerning village water supplies for men and cattle and supplying the wells in the neighbourhood and keeping them sweet.

No. 7. So far as I know the deepest borings ever made in this district were the two carried out in Viramgam Town some 14 years ago. They were about a hundred feet deep, but the supply tapped was meagre, and the water not very pure. Arrangements are now being made to make one or two borings in Viramgam Taluka 200' deep, and the result of these will be anxiously awaited. Shallow borings in wells have been found in a few places to increase the supply, but more experiments are necessary before a definite opinion can be expressed on the point. The heavy cost of boring and uncertainty of success are a great deterrent to private owners resorting to them to any appreciable extent.

No. 8. Land was being injured by water-logging in Viramgam Taluka, but that has lately been remedied by the construction of several drainage channels during the last famine. Similarly water-logging in Sanand Taluka has been, to some extent, remedied by the completion of the Narsingpura and Ozan Drains and the partial completion of the Godhavi Goraj Drain. The last work requires to be completed. A new drain from Chekla southwards is also necessary. In Dholka Taluka there is considerable water-logging near Bagdra for which a drain has been sanctioned by Government. The drains in Sanand and Dholka Talukas are proposed to be carried out during the present scarcity if required as famine relief works. The drains are constructed from Imperial Funds. The drains would result in increase of revenue by enabling relinquished lands to be gradually taken up again and preventing further relinquishment of land. The drains should, however, be utilized, as far as possible, for filling tanks. Surveys for this have lately been carried out.

1. Q. (The President)—You are Executive Engineer of the Ahmadabad District?—Yes.

2. Q. How long have you held that office?—For four years.

3. Q. Before that where were you?—I have been serving in this District off and on for about 14 years. Before I took over charge of this district, I was Acting Superintending Engineer, Northern Division, for about seven months.

4. Q. Then you know this district intimately?—Yes.

5. Q. You have a great deal to do with the Hathmati Canal?—Yes.

6. Q. It is generally pronounced to be a failure from a commercial point of view?—Yes.

7. Q. From the figures furnished by Mr. Beale it appears that the annual cost of irrigation by the Hathmati Canal was Rs. 1'98 per acre while the actual return was

No. 9. The following table gives the required information:—

Statement of works carried out by famine labour in 1899-1900 in the Ahmadabad District.

Classification.	No. of works.	Total famine expenditure.
		Rs.
Railway	1	1,54,523
Collecting road metal	6	1,75,869
Canal excavation	2	2,03,278
Drainage channels	6	3,01,464
Deepening irrigation tanks	32	10,93,820
Deepening Local Fund tanks	30	9,42,750

It is desirable to complete as a charge against Imperial Revenues the following works uncompleted at the end of the famine:—

1. Khari Cut Extension—

The main channels have been completed, but the branches and distributaries as well as all masonry works remain to be carried out. This scheme, when completed, is estimated to irrigate some 12,000 acres of rice land as against 3,000 acres now irrigated. The cost of the remaining works, including the Bokh Reservoir which is necessary for securing the required supply, will be about 3 lakhs. The normal cost of the channel completed by famine labour is Rs. 1,07,446.

2. Godhavi-Goraj Channel—

More than two-thirds of this channel remains to be completed. Until the channel is completed it will be more or less useless, and the anticipated benefit to the water-logged lands will be delayed.

The deepening of the first ten miles of the Hathmati Canal has resulted in materially increasing its discharge and preventing the growth of weeds. Last year it enabled a large quantity of water to be sent down *via* the Bhojwa Channel to the Chandola Reservoir of the Khari Cut. The results of completed village tanks are not yet fully apparent as the rainfall both last year and this has been scanty. Last year, however, the run-off was somewhat better and several of the tanks filled and held water.

No. 10. This district cannot be said to be ordinarily liable to famine, still a programme of works sufficient to give employment to 183,000 people for three months is ready. In addition to these a number of small village works are being surveyed and kept ready in case of necessity.

Rs. 2'34?—In the first few years we found that there was no return at all.

8. Q. Why?—Irrigation was not sufficiently appreciated by the people, but gradually they began to take the water. For the first 12 or 13 years the return was very small; it did not pay the working expenses. Again, the canal was made in a tract not fit for rice cultivation, which was a great mistake.

9. Q. It was made 25 years ago?—Yes.

10. Q. I think it was one of those projects which are marked "important" more on engineering than on agricultural grounds?—Yes.

11. Q. You have taken measures lately to regrade the bed of the canal?—Yes.

12. Q. With what results?—The result has been that during the last year, when there was a flood in the river, the velocity was much increased and the former drawbacks greatly remedied.

13. Q. There is less percolation and less loss?—Yes, and there is a larger discharge.

14. Q. It runs more quickly?—Yes; owing to the slow velocity there was trouble from silt and growth of weeds.

15. Q. Has that reduced percolation?—Yes; scouring is now noticed in one or two places.

16. Q. You say in your memo. "the area of Khar land is about 10 per cent. of the area irrigated and is not perceptibly increasing"?—That refers to the salt land on the Khari Cut Canal.

17. Q. On the Hathmati you say there is no salt land?—No land has turned salt under the Hathmati.

18. Q. There is a proposal for a large storage of water for the Hathmati Canal?—Yes; I have had nothing to do with that project.

19. Q. There has also been a project for the Bokh reservoir?—Yes.

20. Q. The Bhujwa channel was an alternative scheme?—Yes; at first it was proposed to make a considerably higher dam across the Bokh and make the reservoir much bigger; subsequently it was proposed to divert the surplus water of the Hathmati through this Bhujwa channel into the Khari at a small cost. It has cost about Rs. 7,000.

21. Q. How much water do you think will be got in that way?—In normal years we expect the discharge to be 60 cubic feet throughout the kharif season.

22. Q. You brought forward this scheme for the Bokh in addition to the other schemes?—Yes.

23. Q. Your scheme provides for a 35 feet high dam across the river?—Yes.

24. Q. You cut down the former project?—Yes.

25. Q. Because less water was available?—In the former project it was proposed to feed the reservoir from the Hathmati Canal, we have now taken water from the Hathmati Canal through the Bhujwa Channel.

26. Q. On what do you base your calculation of storage, on the mean or the maximum rainfall?—Upon the mean rainfall of the year and we take a certain run off. In this case the run off is $\frac{1}{4}$ th of the rainfall.

27. Q. (Mr. Higham)—You mean average rainfall?—Yes.

28. Q. (The President)—Suppose you went upon the maximum rainfall, would you get too much water?—That depends upon the intensity of rainfall; you might get 10 inches of rain in one day and get too much water, or might have 10 inches distributed over two days and it might do no harm.

29. Q. You think there would be danger of damage by floods?—No; but it is not worth making a costly scheme on the chance of a rainfall which may only occur once in ten years.

30. Q. Have you got the Khari project complete?—We have completed the earthwork only. It was sanctioned during the last famine. I am speaking of the Khari Cut extension.

31. Q. You say waters from three sources are stored in the Chandola tank; what are the three sources?—The first source is the catchment of the Chandola tank itself; it comes from a long distance; the second source is the Khari Cut; and the third is the surplus water of the Hathmati.

32. Q. Is the Chandola tank large enough to hold this water?—It has been increased; its former capacity was about 50 millions cubic feet, it has now been increased to about 100 millions cubic feet.

33. Q. Is that sufficient?—Yes, as a distributing reservoir; for a big system it is too small a reservoir; it will refill from time to time throughout the kharif season and the water could be distributed as required.

34. Q. Roughly speaking what is your estimate for these extensions?—If carried out as a famine work the expenditure would be a lakh-and-a-half of rupees. Normally the expenditure should not be more than a lakh of rupees.

35. Q. Including masonry works?—No, not masonry; the masonry works and distributories will cost about two or two-and-a-half lakhs more.

36. Q. You say here "tanks in the Ahmadabad District are mostly supplied with water from their own catchments." Did you get funds to repair the sluices or clear out silt from any of these tanks?—Yes.

37. Q. How much did you get?—About Rs. 10,000 a year during the last nine or ten years.

38. Q. That does not go very far?—No; and even that was not spent; the budget is sanctioned in the month of June, and in June the time for repairing the tanks is past and gone; the proper time to repair these tanks is from April to June. We should get permission to start works in anticipation of the budget sanction.

39. Q. If it could be arranged to get permission for the Public Works Department to start works in anticipation of the budget grant it would be possible to spend a larger amount?—Yes.

40. Q. (Mr. Higham)—The budget is not sanctioned till June?—Not generally; another cause of the lapse of funds is that a sufficient number of plans and estimates are not kept ready. I think it would be desirable to have a large number of plans and estimates ready on hand.

41. Q. I suppose you have not got establishments to enable you to do that?—It would not be difficult to provide for establishments if it was once taken in hand seriously. Then, a great deal of time is lost in ascertaining if the people are willing to pay the 10 per cent. contribution. The general impression is that according to Government orders the contribution ought to be taken from the people before any tank is taken in hand. Government have left it to the discretion of the Collector to remit this 10 per cent. contribution; still, as a matter of fact, a great deal of time is lost in making inquiries whether the people of a particular village are willing to contribute. Taking all these things into consideration it is not possible to expend the full grant.

[Mr. Muir-Mackenzie.—The question of abolishing the contribution is under consideration.]

42. Q. (The President)—How much of the Rs. 10,000, do you spend?—About half. I have got the exact figures of the last seven or eight years which show that we have been able to spend about Rs. 30,000 on these tanks.

43. Q. (Mr. Ibbetson)—In paragraph 20 you say that in ten years there has been an expenditure of Rs. 25,648 on tanks?—Yes.

44. Q. Then I suppose you have repaired a great many of the tanks?—Not a great many.

45. Q. What was the largest amount spent in any one year?—I cannot say.

46. Q. It is proposed to spend some five lakhs of rupees in 30 years?—Yes; on all the tanks.

47. Q. Are there any tanks which are not in a ruinous condition?—Very few of them are in a ruinous state and past repair.

48. Q. (The President)—The figures in your memorandum are a rough forecast?—Yes, we may have taken so many rupees per tank.

49. Q. By repairing the tanks will the area of irrigation under them be much increased?—I do not think so; it will be made more secure.

50. Q. A number of old tanks will be supplied under the Khari system. The idea is to use up all the water?—Yes.

51. Q. You say none will be wasted?—In big floods some of it will be wasted.

52. Q. I notice that for the Sabarmati Canal a cut of 40 feet is proposed?—First it is 40 feet; and then it is about 20 feet.

53. Q. The deep cutting is only in the first mile?—Yes.

54. Q. You propose to build a weir across the Sabarmati?—Yes.

55. Q. Would you have a permanent bar across the river?—Yes.

56. Q. How high?—It will be five feet higher than the summer water level. The project was prepared in 1875, but not by me.

57. Q. Supposing you made it ten feet would it be dangerous?—Yes; because the foundation is sandy; there is no rock; we have got clay below the sand.

58. Q. What volume of water will be held up by the weir?—I do not know.

59. Q. Have you had levels taken?—The fall in the river is not more than a foot and-a-half per mile and the height is not more than six or seven feet; we cannot store much water. The flow in the river is considerable.

60. Q. Would it be worth storing water if you can put up gates?—That may be done in the cold weather if you put revolving gates.

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61. Q. Has that been thought of?—I have been thinking of it; I was not called upon to submit a written report on this point.

62. Q. What stage has that project reached?—It is before Government.

63. Q. You say the cost will be about Rs. 18,60,000?—Yes.

64. Q. You say 23 per cent. for establishment charges?—That is not the actual establishment required; but a certain percentage fixed by Government; it includes establishment of all kinds. It is simply a nominal figure.

65. Q. How far does the canal from the Sabarmati go?—It is 27 miles long and goes as far as Dholka.

66. Q. Does it supply any tanks?—Yes; the whole place is full of tanks.

67. Q. To go back to the question of irrigation tanks, you say they irrigate 26,600 acres; where did you get these figures from?—They are the result of inquiries made by the Public Works Department in 1894. A subordinate was sent round to the villages and he got the figures from the village books.

68. Q. Your reply to question No. 8 relates to water logging in the Viramgam Taluka; have you heard any complaints against the drains made there?—No.

69. Q. No complaints in the dry season?—Only one drain was made before the famine and no objection was made. In the first three or four years a good deal of waste land was taken up by the people; then in 1894 a big flood came from the Gaikwar's territory and did a lot of damage; the damage was enhanced by the construction of the Viramgam Mehsana Railway which blocked up the water; the consequence was that a large area was relinquished.

70. Q. (Mr. Jebbison)—Was the drain large enough?—No; not for heavy floods, we have lately made a second drain which is much bigger than the first; it is supposed to carry all the water coming from the Kadi side.

71. Q. (The President)—Have you heard complaints about the silting up of rivers?—I have.

72. Q. Have you examined the Sabarmati river?—I have; the silting is going on very slowly, so slightly that it cannot be noticed in a short period.

73. Q. (Mr. Higham)—You say you have an allotment of Rs. 10,000 every year for village tanks?—Yes.

74. Q. You don't spend it because you don't get orders in time?—Yes.

75. Q. Do you incur no expenses until you receive orders in June or July; you draw your own pay?—Yes; works commenced during the previous year are kept in progress without waiting for the budget, but I cannot start new works without special permission.

76. Q. Do you ever get special permission?—I tried once when I was in charge of the Surat District, but got no reply before I left.

77. Q. When you get Budget orders you cannot go to work because the tanks are full of water?—Because the rainy season has commenced and the tanks are full of water; they are full of water more or less during the cold season and we cannot commence work until perhaps January or February and we have got only two months to do the work in.

78. Q. You have also to work up your estimates?—Yes.

79. Q. How long does this take?—It does not take long; it depends upon the size of the tank; a sub overseer makes the survey.

80. Q. What sort of survey?—He has to take levels and find the catchment area.

81. Q. Why has he to find the catchment area if it is only a question of digging out the tank?—These tanks are not merely dug out.

82. Q. What is done?—Irrigation tanks do not require deepening as a rule, we have to repair the bund and we try to raise the full supply level if possible.

83. Q. By raising the bund?—Yes. We simply take a longitudinal section of the bund, measure the catchment area of the tank, and take cross sections of the bund.

84. Q. Why do you want the catchment area?—Because it is laid down by the rules for preparing plans and estimates of these tanks. For tanks which are not taken in hand for a large number of years it is necessary to make complete plans showing how the tank will be fed from

the catchment. A large number of these tanks have not been touched for years.

85. Q. How many tanks have you got?—1,236 tanks, large and small.

86. Q. If each tank is overhauled once in 20 years you must clear about 60 tanks a year?—Yes; but it is now proposed to give up about 400 small tanks.

87. Q. You will then have only 800. It will not take long to survey them?—Out of these a good many larger ones have been repaired in past years. During the last famine we repaired 32 tanks.

88. Q. Not more than that? What did you do as relief work?—The people were employed on village tanks, railways, and roads.

89. Q. Why did you not put them on your tanks?—Because we had to select localities for relief purposes; we were not free to start works wherever we liked; the tanks were not always in the right places and the number of works in hand at one time was limited by Government orders. They would not let us do more than about 20 or 25 works at the same time.

90. Q. You have only 800 tanks which want repairs; if you cleared them in 20 years, that would be 40 tanks a year?—Yes.

91. Q. That would not require a large establishment?—No.

92. Q. Have you a list of these tanks?—Yes; it was prepared by the Public Works Department in 1894; previous to that we had no regular lists.

93. Q. Are you taking them up for repair in rotation?—No; before the tanks are surveyed inquiries are made whether the villagers are willing to pay their 10 per cent. contribution. The villagers apply to the Collector; the Collector writes to the Public Works Department, and the Public Works Department inquire of the Collector whether the villagers are willing to pay the contribution. In some places the villagers decline to pay; in other places they are willing to contribute, and then the plans are prepared.

94. Q. How long does it take to get a reply from the villagers?—In some cases it takes months.

95. Q. How long does it take to survey the tanks?—That depends upon the establishment and how the matter is taken up.

96. Q. With regard to the Sabarmati Canal you have expressed an opinion that it ought to pay 5 or 6 per cent.?—Yes.

97. Q. What area do you propose to irrigate?—About 32,000 acres.

98. Q. Mr. Beale estimates that the return will be only 1 per cent. He reduces the area very much?—That is a matter of opinion. In the first place Mr. Beale has based his estimate on the total culturable area being 75,000 acres; I find that the culturable area will be a lakh of acres.

99. Q. The talukdari records show 59,000 acres of rice; you don't accept that figure?—No; I found out the total area from the Survey Settlement Report. I think we shall get 30,000 acres of rice annually.

100. Q. If you have to start relief works could you put relief labour on the big out?—Yes.

101. Q. Are you ready to start; is it lined out?—No; but it would not take long to line out a portion of the canal; if I receive instructions to commence the survey to-day I could start work within a month.

102. Q. You could employ any amount of labour?—Yes.

103. Q. What is the length of the canal?—The main canal is 27 miles long.

104. Q. You say the rivers raise their beds?—Very slowly.

105. Q. What have you got to go upon?—Only hearsay.

106. Q. You have never made measurements?—Never.

107. Q. (Mr. Muir-Mackenzie)—Is it a fact that the bed of the Sabarmati is rising?—Near Dholka silt is forming here and there, but I cannot say that the bed of the Sabarmati is rising perceptibly.

108. Q. People say you can ford it now at Shahibag at a time of year when in former days you had to cross it by ferry?—I think people say that in former years it was impossible to ford the river near Shahibag in February, during the last eight years it has been quite possible to do so.

I think this impression has been caused by the scanty rainfall of recent years.

109. Q. (*Mr. Higham*)—Is the Nal in your district?—Yes.

110. Q. What is it?—It is a large shallow lake.

111. Q. Has it brackish or fresh water?—It is sweet till the month of January; and then it becomes brackish.

112. Q. Does the water lie there all the year round?—Yes, more or less.

113. Q. Have you any idea of draining it?—No.

114. Q. Could you take the water anywhere else?—It is a difficult question to answer without a survey.

115. Q. What is the size of the lake?—About 20 square miles.

116. Q. How deep?—About five or six feet.

117. Q. (*The President*)—Is the water above the level of the sea?—I could not say; I think it must be a little higher than the sea.

118. Q. It is between the Rann of Cutch and the Bay of Cambay?—Yes.

119. Q. When you have no rainfall does it contract?—Yes.

120. Q. Does it depend upon rainfall?—Yes.

121. Q. Have you any idea of the feeding of these tanks from rivers?—Generally the tanks cannot be fed from rivers; it is only possible in the case of the Khari river. In the Matar Taluka it is possible to feed the tanks from the river by making cuts.

122. Q. Has that been tried?—I have made trials to that effect, it is only a matter of money, it is quite feasible.

123. Q. Is there any idea of making these cuts in case you want to employ relief labour?—I have started one of these tanks in Kaira this year for famine labour.

124. Q. Is relief labour going on now?—Yes; the tank is under the Kaira Engineer.

125. Q. What are you going to do in Ahmadabad in case of famine?—We have got two or three drains to make; and the Bokh reservoir dam, some railway work and the Sabarmati Canal.

126. Q. Where is your programme? Have you got it here?—We have got it ready in print, but I haven't got a copy here.

127. Q. Has it been approved by the Local Government?—It was approved by the Commissioner and sent to the Local Government and approved by them.

128. Q. You speak of the leakage of the Hathmati Canal?—We have diminished a great deal of it by improving the slope of the first ten miles of the canal.

129. Q. Area irrigated by that canal cannot be extended?—It is not possible to extend it, because the soil is not suitable for rice; the maximum rabi cultivation is about 3,500 acres.

130. Q. The soil is not suitable for rice?—Not at all; but the canal will not pay unless you grow rice. No canal in Gujarat will be of any good except for rice.

131. Q. Supposing the canal was not there, what would the rayats grow?—Wheat, bajri and juari.

132. Q. They make more out of rice?—Yes, but it is rather expensive to Government, because we are obliged to give them three times the water that is required for rice elsewhere. During the monsoon the only crop requiring water is rice.

133. Q. You cannot store water?—No, we have no reservoir.

134. Q. Could you not pass the water down for other irrigation?—I made proposals to stop rice cultivation on the Hathmati Canal altogether; it was so wasteful; I proposed to give the water to the Khari Cut, where it would irrigate three times the area it does here; but nothing came of that proposal.

135. Q. When did you make the proposal?—Some years ago.

136. Q. It is still under consideration?—I do not know.

137. Q. Does rice do any harm on the Hathmati?—No; but we are not getting the same benefit from the water that we would here.

138. Q. (*Mr. Ibbetson*)—If you have the water, could you not extend rabi cultivation on the Hathmati Canal?

—No, because the soil is so sandy; it takes a lot of water; it is not possible to extend rabi cultivation; you can get 5,000 acres at the most.

139. Q. The people don't want water for rabi?—They take it to a small extent; only people who have no wells are using canal water.

140. Q. Rupees 5,30,000 which you mentioned is to be spent on putting the tanks into good order and it would cost that amount whether it is done now or spread over 20 years?—Yes.

141. Q. They have all been mended of late years?—No; only a small number of them.

142. Q. Would one-third of the annual revenue be sufficient to keep them in good order?—It would be more than sufficient.

143. Q. What would be sufficient?—About one-fifth of the revenue.

144. Q. (*Mr. Muir-Mackenzie*)—Are there no orders of Government that the tanks should not be repaired without special sanction, if the cost of repairs exceeds ten times the revenue?—Yes; there are orders to that effect.

145. Q. (*Mr. Ibbetson*)—And where it is anticipated that the cost of repairing is not more than ten times the revenue?—Such cases would be few.

146. Q. These tanks have not been repaired?—Only a few of the more important ones have been repaired.

147. Q. The Hathmati Canal is credited with a water rate of so many rupees an acre?—Yes, subject to the reduction of the water rate fixed at the last revision of settlement.

148. Q. On the Khari Cut also is there a fixed water rate?—Yes, there is a canal rate of Rs. 7 per acre, subject to the deduction on account of water revenue assessed by the Revenue Department.

149. Q. Do you think this credit represents the full value of water?—I think the rates now charged are very fair; Rs. 7 on the Khari Cut and Rs. 3 on the Hathmati Canal with deductions of water rate which have been fixed by the Survey Department.

150. Q. Rupees 7 is the canal water rate?—Yes; but we do not take credit for that.

151. Q. (*Mr. Higham*)—How is that?—I do not know how they are shown; we simply take credit for sums realized; the whole of the rates are not credited to us.

152. Q. (*Mr. Ibbetson*)—Suppose the water rate is fixed at Rs. 2 per acre; then a man irrigating rice has to pay Rs. 2 in his consolidated assessment and Rs. 5 as canal dues; what are you going to credit to the canal, Rs. 5 or Rs. 7?—Only Rs. 5.

153. Q. Water rate is not credited by you?—No.

154. Q. Don't you think you have a fair claim to it?—No; we are supposed to supply less water from our canal to fields on which the Survey Department has fixed the rate for water at Rs. 2, because the field has got certain water advantages already.

155. Q. This water rate means a rate for rain?—For rain as well as tank.

156. Q. (*Mr. Ibbetson*)—Why is the water rate on the Khari Cut double that on the Hathmati Canal?—Because the soil is much richer and more suitable for rice. The Hathmati soil is not suitable for rice, it is very sandy and not so rich as the Khari soil.

157. Q. Out of the 1,300 tanks most are small; are there any large ones?—There are a number of large ones also.

158. Q. You do not think there is much room for making new tanks; have surveys been made?—No, I do not think we could find many sites for new tanks.

159. Q. You do not think it is worth while making a survey?—I do not think so except in certain parts.

160. Q. You would survey certain parts?—Yes, but nothing extensive.

161. Q. You say that Local funds have been spent on irrigation tanks?—Yes.

162. Q. Supposing the Local Boards had the water revenue assigned to them, do you think they could be usefully employed in repairing the smaller tanks?—I think it would be difficult for them to manage them.

163. Q. Why?—Because they have got limited establishments.

164. Q. If money is given them they could train men properly?—That is a question which I have not thought out.

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165. Q. (Mr. *Rajaratna Mdlr*)—Is there a rule in the Bombay Presidency that land within a certain distance of a canal constructed by Government is liable to pay water rate, whether irrigated or not?—Yes.

166. Q. What is the distance?—Two hundred yards.

167. Q. For percolation?—and whether irrigated or not?—Yes; provided a wet crop is grown.

168. Q. On the Hathmati Canal how much of the area commanded comes within the prescribed distance of 200 yards?—About 300 acres.

169. Q. Does the rule refer to branch channels also?—Yes.

170. Q. Mr. Beale classifies tanks as first class and second class. What are first class works?—They are big tanks; I don't know the distinction.

171. Q. How many tanks were repaired during the famine?—Thirty-two.

172. Q. What amount was spent on them?—About ten lakhs.

173. Q. Rupees 10,00,000 on 32 tanks?—Yes.

174. Q. What would be the normal value of the work done?—About 6 lakhs.

175. Q. Were they big tanks?—Yes.

176. Q. What was the revenue they paid before they were repaired?—I could not say.

177. Q. What probable increase do you expect?—A fair increase.

178. Q. Can you say from personal knowledge that in their present condition these tanks are capable of irrigating the full area?—In fairly good years they are.

179. Q. You say that 23 per cent. for establishment charges is a heavy item?—Yes.

180. Q. What is the actual cost taking the whole district or division?—I could not say.

181. Q. You must have some idea. Would it be 20 per cent.?—Perhaps not more than 12 per cent. for large works.

182. Q. I am not referring to any particular works; taking an average of three or four years would a 20 per cent. debit be very much higher than your actual charges?—Twenty-three per cent. is debited for large works.

183. Q. What is debited for small works?—There is no debit made; actual charges are debited. On the Sabarmati project we would be debited with 23 per cent.

184. Q. There are some debits under the heading of collection charges?—Yes.

185. Q. Will you kindly explain what they are?—A statement is prepared by us of the amounts to be realized from different landholders for water supplied from our canals. This statement is sent to the Collector and the Collector realizes. The village officers are paid 5 per cent. of the actual realization for their trouble; this is charged to the works.

186. Q. For what works?—Only for those for which capital accounts are kept.

187. Q. In this statement collection charges and gross revenue are given; you will find the charges are mostly 10 per cent.?—On the Hathmati and other capital account works they charge 5 per cent.; I verified that yesterday; we submit a statement to the Collector when our assessment work is finished; the whole work of collection is managed by the Secretariat and the Revenue Department.

188. Q. What is the cost of the establishment?—It comes to very little.

189. Q. You have a separate measuring establishment to maintain?—It is not a separate establishment; only additional surveyors are employed.

190. Q. Once the land is irrigated is it not classed as wet permanently?—No; you are not bound to pay water rate on the same land always.

191. Q. Do you receive revenue both from tanks and canals?—I simply look after the canals; all tank revenue is collected by the Revenue Department; I have got nothing to do with that.

192. Q. You have no major tanks under the Public Works Department?—No.

193. Q. In reply to printed question 15, you say "irrigation is supplemented by well water in case of late commencement of rain and no supply in the reservoir

for rice seedlings." In such cases do you make any abatement in your water rate?—Yes.

194. Q. Do you remit the whole water rate?—Yes; if the whole crop is destroyed we take nothing.

195. Q. Supposing a crop is matured on the canal supply supplemented by well irrigation?—We charge half rates.

196. Q. In your written reply, you give the following areas:—

	Acres.
Hathmati Canal	8,000
Khari Cut	3,000
Khari sluices	8,800
Tanks	26,600

Do you think those areas will be protected in times of drought?—Unless we have storage on the Hathmati Canal the arias on the canals could not be protected.

197. Q. In times of drought could you protect the areas mentioned?—We could not protect them at all. Last year and this year there was not a single acre protected.

198. Q. When the storage works are completed will the Hathmati Canal be able to protect that area?—I doubt it very much. In a year of complete drought like 1899 I do not know whether the bigger reservoir on the Hathmati Canal would give any appreciable protection because the reservoir would very probably run dry.

199. Q. (Mr. *Muir-Mackenzie*)—Regarding rice cultivation in this district that does not receive water from the tanks do you support the Commissioner's statement that it fails in 2 or 3 years out of 5?—Yes.

200. Q. Do you think that there are very few sites for tanks left?—Yes, in the rice country.

201. Q. Is it worth while having surveys?—It may be worth while having a few surveys made.

202. Q. Saline efflorescence is caused in your experience by over irrigation?—No.

203. Q. And water-logging?—On the Khari about 10 per cent. of the land has suffered badly on account of waterlogging and salt; but that system has been going on for the last 100 or 200 years.

204. Q. Has water-logging been increased in the country of late years?—Yes, considerably in Virangam and Sanand on account of the construction of a drain of late years by the Gaikwar. The first serious complaints of waterlogging began after the great flood of 1894.

205. Q. It was caused by that flood?—Yes; the flood was intensified by the Kadi Division drains made in the Gaikwar's territory.

* 206. Q. You spent 10 lakhs in the famine on repairs of irrigation tanks?—Yes.

207. Q. Was it all spent on repairs?—Only to a small extent on repairs, mostly on improvements, such as deepening.

208. Q. The 10 lakhs were spent simply on account of famine?—Yes.

209. Q. Had it not been for famine on these 32 tanks we should not have spent more than Rs. 50,000?—No.

210. Q. If you had had more money to spend you could have repaired more tanks?—It was not practicable.

211. Q. Why not?—We were restricted as to the number of works by the instructions of Government; we might have done a larger number of tanks in 1899 but we were restricted.

212. Q. Due to instructions as to concentration?—Yes; we could not employ 100 people on these tanks; we were obliged to employ a large number—5,000 or 10,000—in each place.

213. Q. The charge for percolation is very high on the Hathmati Canal?—Generally.

214. Q. I never heard of such a high charge anywhere else?—It is in accordance with the Act. The Canal Act lays that down.

WITNESS NO. 22.—MR. W. H. WHITE, C.E., SUPERINTENDING ENGINEER, N. D.

Mr. White.

5 Dec. 01.

I.—Letter from Superintending Engineer, Northern Division, to the Chief Secretary to Bombay Government, Famine Department,—No. 6114, dated 25th November 1901.

In reference to Government Resolution No. 2275 of 26th October 1901 and intimation that I am nominated as a witness before the Irrigation Commission, I have the honour to state that the memorandum accompanying the Government Resolution and the detail questions in continuation of it appear to require replies especially from each district and do not admit of generalization for the whole Division. I therefore refrain from attempting details and confine myself to giving my general views on Gujarāt in light of the memorandum and brief answers to the second paper. My experience of Gujarāt goes back to 1869, when I was an Assistant Engineer on the Bombay, Baroda and Central India Railway, and with the exception of about two years when I was in the Deccan, my service has been entirely in Gujarāt and Kāthiāwār. I do not hesitate to at once say that Gujarāt is not a district subject to famine, and in my opinion is not in want of famine protective works. It is essentially a very fertile land, which in normal years—and these are the rule and not the exception—yields a good return to its agriculturists in crops they can raise without aid of irrigation; but well-irrigation is practised more or less all over it, as water is generally within workable depth, and profits from it are large in the rich soil of the country. Irrigation from tanks is also practised to a certain extent when the tanks lend themselves to it, while the only canal systems we have in the Division (the Hathmati, Khari Ont and Khari Sluices in Ahmadabad) are appreciated and patronized for rice cultivation, but the country is in no way dependent on their aids to cultivation, its staple crops being grains and cotton, both of which it can grow without irrigation. By these remarks I do not intend to in any way deprecate irrigation, but make them to illustrate my opinion of the natural capabilities of Gujarāt country. The geological features of the country under report may be divided into a few main heads. That from Surat Collectorate in the south to the north of the Broach Collectorate where it meets the Gackwar territory is all more or less rich black soil growing grain and cotton without any irrigation; the cultivators preferring these ordinary crops and not going in for irrigation except in a small way and special cases in abnormal years. Water is found almost everywhere in wells fed by percolation of surface water in most cases but from springs or underground streams in others, the strata of the sub-soil being saline in many places and especially towards the fringe of the country along the seaboard where deepening wells leads to getting salt water. A large number of rivers run through the Surat District, but are subject to tidal influence from 10 to 20 miles up. In Broach the rivers are few and small if you exclude the Nerbudda. North of the Mhye River you enter Kaira and here the black soil is lost, its place being taken by a kind of loam which extends up north more or less mixed with sand and forms the general features of the soil up through Kaira and Ahmadabad, and so far as that goes on up to Pālanpur getting more sandy the further north it advances. The western tālukas of the Panch Mahāls come under the same category and its only exception is some of the western and north-western tālukas of Ahmadabad, Viramgām and Sānand, with parts of Dhundhuka and Dholka, where there is a certain proportion of black soil that grows cotton. The country is generally well served with a number of rivers running from east to west through it which have a more or less perennial flow in normal years, and no doubt largely supply the wells of the district which are good and plentiful, varying in depth from 25 to 100 feet. The Eastern Panch Mahāls is a different nature of country altogether, being hilly and heavily timbered with the valleys, more or less black soil and fertile as a rule, but with a good deal of stony waste land interspersed. Good water is obtainable as a rule in wells of shallow depth sinking deep-reaching rock. Irrigation in the Division may be summed up shortly. Of canals there are none excepting the Hathmati and Khari system in Ahmadabad, which serve but a small portion of the Collectorate and are failures from a commercial point of view, though in normal years they encourage the growing of "rice," and usually some 7,000 acres of rice are grown with their aid. The systems depend for their supply on the Hathmati and Khari Rivers, and in bad years they run short, and in the last three years they have practically failed altogether.

Tanks.—When these admit of their water being used with little or no lift, irrigation in small patches is done from

them; Ahmadabad, Kaira and Surat being best supplied with them and Broach and Panch Mahāls the worst.

Bunds.—In the flat low-lying plains of Viramgām and some other places towards the "Null" and Gulf of Cambay the cultivators have introduced a system of throwing up long low bunds across slight depressions in the fields and thus holding up large areas of water which just suffice to give them rice crops below the bunds, while wheat is grown on the damp land above the bunds as the water runs off it.

Wells.—Gujarāt as a rule is plentifully supplied with wells, the largest number being in Ahmadabad and Kaira and the least in Broach. In the loam soil of Gujarāt the wells generally run deep with good supply feeding from percolation through the sandy strata below, but in the more sandy portions the supply seems to be nearer the surface though not so abundant and in some tracts getting brackish and salt, especially if you deepen the wells a little. In the black soil country the wells are generally supplied from drainage of surface water which is held in the black soil and slowly works down to the wells and feeds them. Nearly all the best wells are situated close to tanks or water reservoirs of some sort. The lower water in the black soil districts is very often salt, and hence you have to depend on the percolated surface water though there are cases where deep wells get a sweet supply from springs or other underground supply. I hope to soon have a map ready showing the general water features of wells in all districts. It may generally be said that, excluding garden produce and a little sugarcane, rice is the one crop grown by means of irrigation, and as Gujarāt rice is of fine quality, it is a crop that pays well, and wherever water is available cultivators have taken advantage of it to produce rice. There are also certain tracts of country in both Ahmadabad and Kaira which are known as "rice lands," as they lend themselves to its cultivation by holding up sufficient water within little bunds from normal rainfall to produce rice with but little aid, if any, from irrigation. Since the canals in Ahmadabad were made the people have quickly taken advantage of them to go in for rice cultivation in preference to dry crops, and it is a question how far the production of the more valuable crops may be taken as a benefit to the district generally and a protection against bad years, as it certainly should be, if the people laid up the profits of good years to tide over the losses of bad; but there appears great doubt whether they do this as was so strongly demonstrated in the late years of famine, when the presumed rich cultivators of Gujarāt so quickly fell into a condition of want and distress which their habits of life and food enabled them so badly to withstand. How far irrigation can enrich the country generally and act as a famine protective is difficult to say, but undoubtedly the richer the produce of the country the larger resources there should be in it, and encouragement of irrigation should be useful to this end. Admitting the fact, the question to be considered is how far it can be practically developed. In Ahmadabad, where there are the existing canal systems, we can effect considerable improvements by increasing reservoirs, and the first of these projects is the "Bokh," which, while not costly, will give a considerable increase to the Khari Canal system, and this in my opinion should be carried out. We then have an entirely new scheme, the Sabarmati Canal, which is now under consideration, and this completes the list for Ahmadabad. In Kaira there are no canals at all except a length of the Khari system which supplies some Kaira land, but a suggestion has been made to bund the Mhye River and this may be a possible scheme; but I have not sufficient information at present before me to give any opinion on it. In Surat there is the old Tapti project, but it generally supplies the black soil country and has met with opposition from Revenue Officers.

Tanks.—There are a certain number of these taken up in the famine, of which the best certainly should be completed, and some proposals for the Mandvi Taluka of Surat might be worked up. The Muvālia tank in Panch Mahāls is so far advanced that it would be a pity in my opinion not to complete it. General and more careful attention to all existing irrigation tanks I would advocate, as also surveys to show where the "Bunds" system can be extended and water held up temporarily, as is done in Viramgām. Tanks constructed in black soil do hold water so far as my experience goes, and fairly high black soil bunds can be made, if properly constructed, without masonry "cores."

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Wells.—These are the backbone of irrigation in Gujarāt and should in my opinion be encouraged as much as possible after careful enquiry as to how far the different districts can bear any increase, taking into consideration their resources for manure itself and nature of soil to stand constant irrigating. It will be noticed from memorandum submitted by the Director of Land Records and Agriculture that for Gujarāt the areas irrigated by different systems were as below in the two years: I select 1896-1897 as a normal year and 1899-1900 as a famine year:—

	1897.	1900.
Proportion of total irrigation done by—		
Canals	4.9	...
Wells	76.7	94.7
Tanks	13.3	4
Other sources	5.1	4.9
	<hr/> 100	<hr/> 100

II.—Replies to Questions.

A.—GENERAL.

- Gujarāt generally is a district I have known more or less for the last 30 years as a Railway and Public Works Engineer.
- See local officers' replies.
- (1) No.
(2) No.
(3) Questionable.
(4) Yes, in parts of Broach and Surat.
(5) Not in normal years.
(6) to (8) Revenue officers can best answer.
(9) General fertility of the country and ease with which ordinary rainfall enables good crops to be produced.
- Will be replied to by Revenue officers.
- Do. do. do.
- No. A desire for irrigation has been expressed by the people of Ahmadabad since the famine.

B.—CANALS OF CONTINUOUS FLOW.

- (1), (2) and (3).—Probably from 40 to 100 per cent. from one or other of the reasons.
- (1) Roughly 50 or 75 per cent.
(2) Cannot answer.
- Will be best answered by local officers.
- Will be answered by Revenue authorities.
- Not so far as I know.

C.—CANALS OF INTERMITTENT FLOW.

- See Ahmadabad Executive Engineer's reply.
- Answer to previous Question 7 will apply to this except in sub-head C, when the value of the canal is of a negative order, as the cultivators may prepare land in anticipation of getting water which they never receive.
- The supply of water in Gujarāt is mostly a demand in September and October, and so long as it does not fail the value of the irrigation is not diminished.
- Occasionally; under exceptional circumstances.
- See answer to Question 8.
- Do. do. 9.
- Will be answered by Revenue authorities.
- See answer to Question No. 2.
- See Executive Engineer's reply.
- None.
- No.

D.—TANKS.

- (1) Generally by their own catchment.
(2) By the cultivators themselves in a permissive manner under their own arrangements.

(3) Varies considerably according to rainfall and the crops the water is used for, but generally from July to October.

(4) Varies from a few acres to some hundreds.

24. Differs in different districts. See Surat and Broach Executive Engineer's reply.

25. No remarks.

26. Occasionally and only when essential.

27. Cannot answer satisfactorily.

28. See local officers' replies.

29. Do. do.

30. Do. do.

31. Revenue officers can best answer.

32. Yes, but I regret I cannot at present reply to the final part of the questions.

33. Tanks certainly do silt up and more so in black soil country. I can give no statistics on the point, but tanks from time to time are dug out, the silt being removed dry in the hot weather and often taken by the villagers for purposes of manure.

E.—WELLS.

34. (1) Statements will be submitted, but depths vary considerably from 20 to 100 feet or more.

(2) Generally from percolation—

(a) Not in an ordinary year.

(b) Yes.

(3) Differs very greatly, say, from 3 to 15 hundred rupees.

(4) Unknown.

(5) By bullock "mot."

(6) Unknown.

(7) Do.

35. Can best be answered by Revenue officers.

36. Do. do. do. do.

37. Do. do. do. do.

38. (1) No.

(2) No.

I am not aware of any special assistance having been offered by Government, but local officers have given advice and in certain places trial borings have been made both by Government and private individuals: so far as my knowledge goes, borings have shown favourable results in a few cases, but more generally have failed. I think it would be useful to bore for the purpose of ascertaining whether sweet water can be obtained below the saline strata which exist in a good many portions of the different Collectorates.

39. A question I am not prepared to reply to without going more closely into it, but generally speaking I should be inclined to encourage the construction of wells.

40. Temporary wells are occasionally used in the districts which will admit of their construction, but they are not practicable in very sandy or black soil. They are a very poor protection against drought. I am not prepared to answer the last question.

P. S.—A point, I see, I have omitted to notice is "water-logging." In nearly all the Collectorates of Gujarāt damage from water-logging has from time to time been reported, and in many cases remedial measures have been carried out, but it is questionable with what measure of success, as in many cases where benefit accrued on certain tracts injury occurred on others, and the very cultivators who begged for drains to clear water away from their lands have since in some places asked for them to be stopped up, and in the case of some small drains in Broach have themselves bunded up the drains. The truth is, that we do not yet seem to thoroughly understand all the effects of altering the water conditions on different classes of soil. In some places when we bring water on, it seems to spoil the land by raising up salt; in others when the water is drawn away the people complain that the good top surface soil goes with it, and so on. The heavy floods of 1894-95 which drowned large areas of land in Kaira and, I think, also parts of Ahmadabad made a number of tanks and also wells "brackish," so much so that in some cases irrigation from them was abandoned, the Trag irrigation tank in Kaira being a case in point. I would advocate a careful survey of the results of the drainage so far done before deciding on new proposals.

1. *Q. (The President)*—In your letter to Chief Secretary you say:—"Gujarat is not a district subject to famine and in my opinion is not in want of famine protective works;" you do not recommend that works like the Sabarmati or the Hathmati Canals should be put on the list of famine works?—I think they should be treated rather as commercial works.

2. *Q.* Would you reserve either of them as works to be carried out in famine time as relief works?—I should put the Sabarmati in that category.

3. *Q.* From a commercial standpoint do the Hathmati and Khari Canals pay their way?—I do not think so.

4. *Q.* They are capable of improvement financially?—Yes.

5. *Q.* What would you do to improve them?—Storage is the great requirement of the district which is well served by the river which runs through it.

6. *Q.* Would you advocate a through hydrographic survey of the country as regards catchment basins; I do not mean for direct irrigation but for storage reservoirs?—I should advocate it in places. In some parts where there are great flat areas it would be quite needless. The conditions of the country are not properly known, we have never sufficiently studied the question. The best catchments for storage for the Hathmati and Khari systems are probably in the Idar State. For the Panch Mahals the best sites would be in Baroda where the heads of the rivers lie. There are sites for tanks in our territory, but for small tanks only. A thorough survey of the country is required as we really do not know what is or what is not possible.

7. *Q.* Mr. Lely thinks that the rivers passing north and south of this district are silting up. Have you any personal knowledge of that?—I have visited certain rivers, after a lapse of a good many years, and have noticed that they are distinctly silting up; the resulting delta going further out to sea. For instance, all the waters of the Banas now sink underground and disappear before they reach the sea. The deltas on the Tapi and the Nerbudda have risen so high that cultivation has been started in many of the islands. After ten years I went with Mr. Lely to Dholka and found cultivation where there were only sand and tamarisks before. As far as I can see, the beds have been raised and the channels blocked to a great extent.

8. *Q.* Have any levels been taken?—No.

9. *Q. (Mr Muir-Mackenzie)*—Have you heard that 30 years ago there used to be a ferry at Shahibag?—No. I have some idea of having seen a basin there.

10. *Q. (The President)*—We have heard complaints of damage done by drains in water-logged tracts. Have you seen anything of this?—I am open to correction, but from what I have seen, I think that in certain places the drains have taken off the water too quickly when in flood and have scoured off portions of the surface. I have seen "gutterings" in places, but I do not think that any extensive harm has been done.

11. *Q.* Has much damage been done by floods in past years?—In many floods the Railways held up water over large areas, and in 1891 great damage was done in Viramgam, the whole country being flooded and cattle and sheep drowned. There were complaints that these floods were causing damage to the soil. A great amount of damage has been done in the Ahmadabad and Kaira Districts by abnormal floods in past years.

12. *Q.* What do you consider the best form of famine relief?—Some kind of earthwork. I should think cuttings like the Sabarmati Canal; digging new tanks, improving old ones, and making new bunds would be better than making roads and railways.

13. *Q.* Do you advocate irrigation by steam pumps?—I think that it is a good thing to encourage. There is a tendency among well-to-do people to use pumps for regular cultivation; certain persons are trying the experiment in the Ahmadabad District and on the Sabarmati.

14. *Q.* Men of capital I suppose?—Yes, and Mr. J. N. Tata of Bombay is having deep borings made in the Surat District.

15. *Q.* Then there is a tendency for people to try experiments of that sort?—Yes, for some wealthy ones.

16. *Q.* You see no objection to pumping water out of the river?—From the Nerbudda I see none. In fact, a theory has been advanced by an Assistant Engineer that the only way to irrigate from the Nerbudda river would be to pump the water into an enormous reservoir.

17. *Q. (Mr. Nigam)*—You were speaking about heavy floods; do you know what the effect of these has been?—

The figures of the loss are given in the Statistical Atlas. Enormous damage has been done to crops by heavy floods in certain years.

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18. *Q.* Was the land rendered unculturable?—In some cases lands were covered with sand, in other places the soil was rendered salty. In places like Kaira the tanks and wells were rendered brackish and useless for irrigation for some years.

19. *Q.* Do you propose to make any protective bunds or embankments?—No. It would require a very large scheme to protect the district by bunds. I do not say for one moment that it is impossible to carry out such a scheme, but it would be a very large project and has never, to my knowledge, been seriously proposed.

20. *Q.* You have certain drainage proposals which will have the effect of bringing a considerable area of land under cultivation?—Yes, but I have no figures for them.

21. *Q.* What are your proposals?—I propose to relieve the water-logged areas.

22. *Q.* Can the water-logged lands be improved?—Yes.

23. *Q.* And improving them will result in revenue being paid on them?—I should think so.

24. *Q.* Will there be an increase in cultivation?—Yes, the main object of these drains will be to relieve the land and collect the water. In Viramgam there are large tanks which are filled in this way.

25. *Q.* Are there drainage schemes in the famine programme?—Yes. There is still scope for drainage in places.

26. *Q.* Complaints are made that in dry years these drains take off the water too fast?—I should imagine that to be the case; they want regulators.

27. *Q.* In a year when the rainfall is below the average the drains will have the effect of taking all the water off?—Probably; it has been difficult to judge about this during the past few years. Some of the drains have only just been made; in dry years perhaps they take away too much water; the villagers don't know their requirements.

28. *Q.* With a system of regulators and abundant rainfall could not the water be kept on the lands in dry years?—Yes. There has been instances of this in Broach where the villagers asked for drains and have now bunded them up. Drains without some kind of regulators are not very useful; the Executive Engineers have proposed to provide them in some of the drains in the Surat and other Districts.

29. *Q.* With regulators the drains would be useful?—Yes.

30. *Q.* Are they proposed?—I do not know if definite proposals have been made. The Executive Engineer of Surat has proposed regulators for his district.

31. *Q.* What about these bunds which you describe on flat plains?—The land is flat in Viramgam, and the villagers throw up a system of long low bunds across what are known as *vens*; these hold up the water to a depth of 4 or 5 feet and it spreads over a very large area; they use the water for rice cultivation below the bund, and as the land behind the bund dries they sow wheat and gram. A good deal of cultivation goes on in this way. There was an outcry about it at places and complaints were made that by putting up so many bunds no water was allowed to run to the villages below.

32. *Q.* Do you propose that Government should make these bunds?—We should certainly have a survey made; then the question of whether the cultivators or Government should make the bunds can be considered. That would be a revenue question. We might have to pay compensation if Government did work of that kind. There are only certain places where the configuration of the country would lend itself to these bunds.

33. *Q.* Do you think anything could be done in the way of constructing distributing basins at the mouths of the hill streams?—The only place we really have got sites for such a work is in the Panch Mahals. I have got a man prospecting these now. We can put small dams across the streams and store up a certain amount of water.

34. *Q.* You would not have a high dam?—I think in some cases that might be done. Something in that way might be done in the Mandvi Taluka of Surat and Modasa in Ahmadabad. It is said that in the Panch Mahals there is no land to give water to; I have been there and found that in a good many places there is good soil in the valleys; a good deal of it is covered with stones and is called waste; these would have to be cleared off; I have seen the same sort of soil in Kathiawar brought under cultivation.

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35. Q. Have you got records of the rise and fall of the big rivers?—The only records are in the Railway offices. They have records of the big floods but there is no daily gauging.

36. Q. When there is a great flood you record its height?—Yes, on the bridges which are sometimes swept away.

37. Q. Are not all these rivers crossed by the Railway?—Yes.

38. Q. In some cases they cross two or three times?—Yes.

39. Q. You don't think it possible to arrange with the Railway people to take records daily during the monsoon season, as is done in the Punjab?—Yes, I think we could do so where there are bridges.

40. Q. In the cold weather it is not so important?—No.

41. Q. You could take a minimum gauge?—Yes, we do that.

42. Q. That is a matter of gauging the discharge; I am speaking of a gauge registering the height of the river?—Yes, practically, we do that.

43. Q. These irrigation works that you have in Gujarat are all classed as minor works?—Yes, except the Hathmati Canal, they are classed under the heading of "minor" works. The other works in Gujarat are only small tanks which have hitherto not been properly worked up.

44. Q. What is the Hathmati classed as?—As a productive work.

45. Q. There is a scheme for improving that Canal?—Yes, the Bokh reservoir.

46. Q. You say that the other works are classed as minor works?—Yes.

47. Q. Do you always get as much money as you want for improvements?—As a matter of fact these works are only small tanks. Heretofore there is no doubt that the subject has not been properly looked into as there has been no great want felt for them. They were standing for what they were worth. Now we get from the Government of India about a lakh a year, but we spend only half of it, because the grant comes at a time when we cannot utilize it.

48. Q. You get a grant of about a lakh of rupees?—Yes, I think so, it is in Mr. Beale's report.

Mr. Beale.—The amount is two lakhs a year for the whole of the Bombay Presidency.

49. Q. Is that for first class works, Mr. Beale?—No, for second class irrigation works.

50. Q. (2b witness).—So far as Gujarat is concerned do you get as much money as you want?—No, we want more money; half a lakh would not do much. During the last famine we did a great deal and a great number of tanks were repaired in this famine. Many of them want completing, and for that purpose we want money.

51. Q. Do you want a greatly increased grant to carry out the works which have been proposed?—I do not think so; many of these tanks are really not in bad order; they only want small improvements.

52. Q. Do you depend for your money entirely on the Government of India?—Small contributions are received from Local Boards for repairs of tanks.

53. Q. None of your works are Provincial?—None.

54. Q. They are all Imperial?—Yes.

55. Q. Do you know whether it would be advantageous to provincialize these works?—I have not given sufficient thought to that point.

56. Q. You did not want more money, you had as much money placed at your disposal as you could spend?—As a matter of fact we have not had to do much; there was no outcry and we never felt the want of much money; the people were satisfied; no doubt we could have done more if we had got the money in time. It always came too late—when the Executive Engineer could not do anything. That is now being altered.

57. Q. (Mr. Ibbelton).—You say that Gujarat is plentifully supplied with wells?—Yes.

58. Q. Do you think there is room for increasing the number of wells largely?—I have made some remarks in my statement on the subject. There are a good many wells in Kaira and Ahmadabad, where you have a light alluvial soil, but few in Broach and the Panch Mahals. Wells can be made. In Broach there is deep black soil.

59. Q. In the latter part there is, I suppose, not much scope for digging wells?—No.

60. Q. In the other part there is more scope?—Yes, in the loamy soil there is great scope for the encouragement of irrigation by wells.

61. Q. Would you endeavour to help the people by making trial borings?—We do advise them where there are good sites for wells and where they are likely to get good water. We have got a great deal of information compiled from which we can generally guess where water might be found, but I do not think any Engineer could go into the compound here like a diviner and say "there is water here." We have no geological surveys in Gujarat to help us. My opinion is that a geological survey should be made.

62. Q. What else?—We should also have a surface survey to see how our water can be conserved. In the Sabar-mati and the Khari, a mass of water goes down to the Gulf; if that could be conserved we would be helping the rivers and the wells. I do not think you could do anything in the way of increasing wells without having more information than we have at present.

63. Q. Supposing a rayat wants to sink a well, do you think that a trial boring would be useful?—I do not think so unless you bore down about 20 feet; for if you have got surrounding wells the water runs low.

64. Q. Then you don't think that a trial boring is worth making in any individual case?—I think trial borings are necessary where the water is at great depth, but the cost is very heavy.

65. Q. Could you give me a rough idea of the cost of a trial boring?—It depends upon the soil; it increases the deeper you go; boring 50 feet is expensive.

66. Q. What would it cost?—It costs Rs. 100 to go down 50 feet.

67. Q. What would the tools cost?—Nearly Rs. 1,000.

68. Q. If you want to go down 100 feet it would cost Rs. 200?—From Rs. 200 to Rs. 500; and if you want to go down 200 feet it would cost Rs. 500 or Rs. 1,000.

69. Q. (Mr. Muir-Mackenzie).—Do you consider the repairing of small tanks would be a good famine relief measure?—Certainly.

70. Q. Do you consider such repairs to be the backbone of your relief programme this year?—Yes.

71. Q. Do you mean small tanks?—Small and large.

72. Q. I understand from Mr. Furdunji that orders are necessary to make plans and estimates?—Mr. Furdunji has been in only one district. When famine appears plans and estimates can be made without waiting for formalities.

73. Q. Is there any chance of repairing all the tanks for the Rs. 5,30,000 which they are estimated to cost?—It would be a big scheme, and we are not prepared with plans.

74. Q. If you got ten lakhs could you not repair them? If we have to spend ten lakhs we should spend it chiefly on schemes connected with water. We intend to extend the number of rice tanks; they will be most beneficial.

75. Q. You were talking about having some other works?—Yes; more drains.

76. Q. Would you prefer the Chord Railway?—The Railway would come in very well as relief works. We have to start work in the district where the people are worst off and we cannot march them long distances.

77. Q. In the localities where the tanks are you will not have to commence relief works?—Not in all.

78. Q. Do you think plenty of sites may be found for these rice tanks?—I would not say plenty; there are a good many sites where we might make these tanks, bunding them slightly to hold a certain amount of water, for cultivation.

79. Q. Is this only in the Northern part?—Oh, in several places.

80. Q. In Kaira?—Mr. Robertson, I think, says that there are some sites there.

81. Q. Would you advocate the system which was suggested by one of the witnesses, namely, that on the completion of minor tanks they should be entrusted to Local Boards?—I am not prepared to answer that question without a little more consideration. It depends on what staff the Local Boards have. Local Boards can very well manage small tanks; but they want a working establishment; they must put a man on the work and hold him responsible for its proper management.

82. Q. You think Local Boards can do it?—Yes; I think there is work which the Local Board could do if they have sufficient establishment. They could in some cases improve and enlarge the tanks. I hold in my hands a letter from the Collector in which he says that it would be better to hand over small tanks to civil agency and that

irrigation tanks should be left to the management of the Public Works Department. *Mr. White.*

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83. Q. In order to get the estimates for these works cleared off quickly you will have to employ an additional establishment?—Yes, certainly. Looking to the amount of distress generally, I think that this is the best way of utilizing money.

EIGHTEENTH DAY.

Surat, 9th Decr. 1901.

WITNESSES NOS. 23 AND 24.—MR. GULAB ISHWAR and MR. MOTIBHAI BHAGWAN, Landowners, Amod.

Mr. Golab Ishwar.

9 Dec. 01.

Answers to printed questions by the witnesses.

In the taluka of Amod the land is of four different kinds—(1) black, (2) yellow, (3) mixed, i.e., black and yellow, (4) salt.

There are no irrigated fields at present; but if there are satisfactory (complete) means of irrigation the yield from fields will increase by half as much again.

It is necessary that there should be a rainfall of 35 to 40 inches. The fall should be in light instalments and should be timely to suit the requirements of cultivation. Formerly the district was well wooded and the people were encouraged to plant fruit trees. Those who planted the trees were held to be their owners on whatever land the trees might have been planted. But lately Government have, on the one hand, cut down the trees, and on the other, the people have ceased to plant more trees as they have no claim over them. Thus there being no clumps of trees which are supposed to attract rain, the rainfall has been decreasing and the present fall is only half of what it was twenty years before.

Even during the south-west rains there is ordinarily a want of water felt in some parts. South-west monsoon is the principal monsoon.

Rice, "Bayto", sugarcane, "Kodra" and all kinds of vegetable, as also tobacco, require to be watered by irrigation. Sugarcane is planted before monsoon and then requires to be watered. It requires water every eighth day in all seasons except the monsoon.

Tobacco and vegetable require to be watered every eighth day. Vegetable has to be watered all the twelve months of a year.

Rice, "Kodra" and "Bayto" are planted during the monsoon, and after the close thereof, i.e., in the months of October and November, required to be watered every tenth day.

3. The small tanks in black soil hold water in the monsoon.

Black cotton soil. But they either get dry by the time fields require to be watered, or hold a little water. Embankment can be constructed without "chunam" lime with black earth which is sticky.

If black soil is to be irrigated it is not surprising that want of water-supply should be felt in years of famine. But want of water is felt even in ordinary years, for the crops which are raised by irrigation do not require continuous rain, but only a timely fall at the intervals of eight, ten or fifteen days. Besides, some crops require to be watered every fourth day, while others require water at the interval of a week. Hence it is not possible ever to get rain suited to the requirements of the different crops. Owing to the irregularity of the rainfall a difficulty is experienced in watering the crops at desired intervals. But even in black soil if arrangements for water irrigation supply are made, or if the rainfall is normal, or good, the yield would be good.

In this soil owing to smaller yield, as compared with other lands, in consequence of deficient rainfall there would be a difficulty in the matter of revenue collection. But so long as the cultivator or the khatadar has any other source of income, or has any savings of old there arises no difficulty in the collection of revenue, in accordance with the provisions of the present law.

Owners of black soil fields are extremely anxious that irrigation works be undertaken at State expenditure, but no additional tax be on that account levied from them, or their

rights any way prejudicially effected. If this were done the cultivation, as also the State revenue, will be benefited.

4. Government irrigation works.

If canals from Nerbudda be constructed and their water brought into the Dhadhar river near Bojadra, a great benefit will accrue to the cultivation of this taluka. Besides, it is necessary to construct big wells and tanks in other places.

5 and 6 not answered.

7. Wells.

Rayats have not obtained takavi from Government with sufficient free hand to enable them to construct "pakka" wells; and those that have got takavi have not obtained any concessions.

The best way is for Government to construct wells for the people at its own expense, because Government is the permanent master of the soil. If that were not done it, would be advantageous if, by giving takavi to people, wells were constructed with free concessions. It has particularly to be brought to notice that Government charges interest at 5 per cent. on takavi loans, while deposit of money in banks get an interest of 3 per cent. Then it is clear that Government charges a much higher interest. It is necessary therefore that the rate of interest should be much lowered; if possible, it is necessary to have wells constructed by remitting a portion of takavi loans and interest and by increasing the present number of instalments as may be necessary to suit the circumstances of the cultivator.

Owing to famine in 1899-1900 and 1900-1901 the water-supply of the taluka has decreased by 50 per cent. and in the western part of the taluka, sweet water in some of the big wells has become brackish. In this taluka big wells have not completely dried up, but small wells having dried are left without water.

8. Drainage channel.

There is no necessity.

9. Relief works undertaken during the famine.

In many of the tanks that were dug during the famine many are without any water. The reason of it is the scanty rainfall. This is also due to water being largely absorbed by the new dry earth in the bed of tanks. Though all the water has been absorbed the beds are not yet well formed. Besides in some places the tanks have not been provided with proper inlets. These tanks being situated in village sites are used by the people and do not afford facilities for irrigation. In some of the tanks lately deepened water is not available for cattle to drink.

10. Special request to the Commission.

To ascertain whether artisan wells will prove useful in this district, it is necessary that Government should at its own expense make experiments three or four times in each taluka. It is necessary to have experimental farms in three or four villages in each taluka to show how the fertility of the soil is increased by irrigation, how different kinds of manures can be used, and how to sow different kinds of crops. The people are not possessed of high sort of intelligence to improve the soil unless convinced by practical example.

Mr. Gulab
Ishwar.

9 Dec. 01.

1. Q. (*The President*)—I understand you are a resident of Amod?—Yes.

2. Q. Do you own land there?—Yes.

3. Q. Did Amod suffer much from the famine?—Yes.

4. Q. Was there much loss of life?—Yes, many people died, and also numbers of cattle.

5. Q. How do you raise your crops?—By rain water only.

6. Q. What steps do you think desirable to protect your village against the effects of famine?—Wells to irrigate the land would be useful. By this means fodder for cattle and grain for the people can be produced.

7. Q. Why do you not make wells?—I am unable to sink wells, as year after year we have bad years; and, besides, if I was to build a well, the assessment on the land will be raised.

8. Q. Surely you know that that is not the case. Is that the generally prevailing belief?—Yes, I believe so; the assessment is raised if a well is dug. A water-rate is charged if we irrigate other lands from our own wells also.

9. Q. Can you give any instance to show that that has been done?—In Sarban there is a field, in which a well was sunk by the landowner, and, because he irrigated land during the famine, he was charged a water-rate, and had to pay water assessment for that land, besides the dry assessment he already paid.

10. Q. (*Mr. Muir-Mackenzie*)—When was the well dug?—In 1900.

11. Q. (*Mr. Rajaratna Mdir.*)—Is that dry land or wet land?—It was not previously assessed at wet rates.

12. Q. (*Mr. Muir-Mackenzie*)—What was the assessment before the well was sunk?—About Rs. 5 an acre: Rs. 2 more per acre were added.

13. Q. (*The President*)—In which taluka is that?—In Amod.

14. Q. Were it not for this fear of increased assessment would you sink wells?—Yes.

15. Q. Would you do that from your own means or get takavi advances?—From takavi advances. I think that the period of repayment should be extended, and the interest reduced.

16. Q. How long would you like the period to be extended?—To double the present, which is about five years.

17. Q. Would the people be content to have the period extended to ten years?—Yes, each cultivator should be treated leniently according to his means.

18. Q. What is the rate of interest?—Five per cent.

19. Q. How much do you think it should be reduced?—To 2 per cent.

20. Q. Do you think, if the time was prolonged to ten years and the interest reduced to 2 per cent., there would be a great extension of wells?—Yes.

21. Q. What is the soil like in your villages?—There are four kinds—(1) black, (2) gorat, (3) black cotton and gorat mixed, (4) salt lands.

22. Q. What land would you irrigate under the well?—Gorat.

23. Q. How much land do you own?—100 acres.

24. Q. Do you think, if you had had wells before the famine, you would have been much better off now?—Yes.

25. Q. How much would a well irrigate?—It depends upon the capacity of the water in the well; one well can irrigate four to five acres.

26. Q. I suppose you would like to put down several wells?—I would have one well in each number; the holdings are very scattered.

27. Q. Are there any tanks near your village?—Yes.

28. Q. Did the people owning land under them benefit by them during the famine?—No, there was no water in the tanks.

29. Q. Are the tanks in good repair?—Yes.

30. Q. As regards preparing for another famine, do you think a large extension of wells would be the best thing for the district of Broach?—It would benefit my taluka. I cannot speak for the rest of the district.

31. Q. In ordinary years of rainfall, would these wells be used?—A little, because the rain is irregular. If rain came in proper time, I would not have to use the wells. Rain does not come now when the grain is coming into ear.

32. Q. Before 1899, the rain came pretty regularly?—Yes.

33. Q. Before the famine time, it would have been no use to have wells?—No.

34. Q. (*Mr. Ibbetson*)—If you were going to make wells, and borrowed money from a *sowcar*, what interest would you pay?—It depends upon the man who takes the loan.

35. Q. In the case of a substantial man like yourself?—From three to six per cent.

36. Q. What would a small man have to pay?—Nine to twelve per cent.

37. Q. Have you ever borrowed money at 3 per cent?—Yes.

38. Q. (*Mr. Muir-Mackenzie*)—What for?—For marriage expenses.

39. Q. (*Mr. Rajaratna Mdir.*)—When do you return the money?—Whenever I can.

40. Q. (*Mr. Ibbetson*)—What did you mean exactly when you spoke just now of treating a man leniently according to his means?—Giving a poor man in some cases takavi free of interest.

41. Q. Are there many disused wells in your parts?—Not many; there are only about 200 to 300 wells in the whole taluka.

42. Q. (*Mr. Rajaratna Mdir.*)—Do you know that Government borrows money at $3\frac{1}{2}$ per cent.?—Yes.

43. Q. Then, how do you expect them to take 2 per cent.?—The land belongs to Government, and if cultivators are benefited, it would be to the interest of Government.

44. Q. How?—All the land belongs to Government.

45. Q. How will Government be benefited?—If the people are solvent, the Government assessments will be paid regularly.

46. Q. As regards the water-rate of Rs. 2, the rules in Bombay exempt land in which wells are sunk from increased assessment, are you aware of that?—No; when the land is cultivated, they do charge. When the survey was being introduced, lands situated near the wells were assessed at certain water-rates. At the next settlement, if a well has been sunk in the meantime, Government will charge an increased water-rate.

47. Q. In the case of land on which you paid Rs. 2 extra, is there any tank near that?—No.

48. Q. (*Mr. Muir-Mackenzie*)—What is the sub-soil water-rate?—I don't know.

49. Q. (*Mr. Rajaratna Mdir.*)—Do you know of many cases in your village, in which such extra charge has been made?—No; there may be many, I only know of one.

50. Q. Supposing takavi is given at 2 per cent., repayable in 20 years, will you not be in a position to sink more wells in your land?—I would sink more wells, if I were assured that no further assessment will be levied.

51. Q. For ever?—Yes.

52. Q. Supposing you were told that in the next 30 years there would be no increase of water-rate, and after that a low enhancement for another 30 years; what would be the result?—I cannot pay anything more than I do at present.

53. Q. What is the rate?—More than Rs. 5 per acre.

54. Q. On all your land?—Yes, it is not less.

55. Q. (*The President*)—Was it remitted during the famine?—No.

56. Q. (*Mr. Muir-Mackenzie*)—Would you dig wells in black soil?—Yes.

57. Q. What sort of crops would you irrigate on such soil?—Tobacco, rice, vegetables—in fact everything.

58. Q. Do vegetables grow as well in black soil as in gorat?—No.

59. Q. Does black soil want much more water than gorat?—Yes.

60. Q. Is it beneficial to irrigate cotton?—If it is watered when rain is short and the cotton crop commences to dry up, it will revive. I have not seen it done.

61. Q. If Government were to advance the capital for a well without taking any return, neither principal nor interest, would the rayat be willing to dig wells and then pay *bagayat*?—Not the full *bagayat* rate.

62. Q. How much an acre?—One anna more than the present rate.

63. Q. Were many wells made during the famine in your neighbourhood?—About 10 to 15 wells were dug.

64. Q. Have they been used this year?—Government wanted to charge a water-rate, and so they were filled up.

65. Q. Who said that Government wanted to charge a water-rate?—I was questioned why I dug a well in Government land outside my occupancy without permission.

66. Q. Do you suppose that, if you dug a well in your own land, you would have to pay a water-rate afterwards?—Yes.

67. Q. Do you mean, when the settlement is revised, or will it be done at once?—This year I have been charged a water-rate.

Mr. Wales, Collector of Surat, explained that witness took water from a Government well, and had to pay.

68. Q. (The President)—Is it your impression that, if you take takavi advances and put down a well in your own land, there will be an enhanced rate?—The well I took

water from was not in my own occupancy; it was built by another man.

69. Q. (Mr. Muir-Mackenzie)—Which is the more profitable crop, rice or cotton?—Cotton.

70. Q. If tanks were made, would the people be ready to grow rice instead of cotton?—They would sow rice and cotton together.

71. Q. Do they ever put rice and cotton in one *kiari*. One furrow for rice and another for cotton?—They have no *kiaris* in my part.

72. Q. If a tank were built, would they have *kiaris*? They would put them in fields near the tank.

73. Q. Which would be more profitable, rice or cotton?—Rice is more profitable.

74. Q. (Mr. Ibbetson)—Do they grow rice without irrigation?—No.

75. Q. (Mr. Muir-Mackenzie)—Are there any water-jogged lands in your village?—No.

Mr. Golab
Ishwar.

9 Dec. 01.

WITNESS No. 24.—MR. MOTIBHAI BHAGWAN, Landowner, Amod.

Mr. Moti-
bhai
Bhagwan.

9th Dec. 01.

1. Q. (The President)—Where do you own land?—In Amod taluka.

2. Q. Have you wells on your land?—I sank a well in 1900.

3. Q. Did you get water?—Yes.

4. Q. How much land have you got?—500 acres.

5. Q. Have you many wells?—No, only one well.

6. Q. Did you build that by taking a loan from Government?—No.

7. Q. (Mr. Ibbetson)—Did you get the money from a *bania*?—Yes, I got the money from the *sowcar*.

8. Q. (The President)—Why did you go to the *sowcar* in preference to going to Government?—This was at the commencement of the famine year, when takavi was not being given.

9. Q. Do you propose to make any more wells on your land?—Yes.

10. Q. Will you then go back to the *bania* again?—For the last three years the *sowcars* have not lent money, and so I will go to Government.

11. Q. You have had the experience of this famine in the last few years, do you think you would have been in a better position if you had had wells?—Yes.

12. Q. Are there many wells in your taluka?—No.

13. Q. Are your neighbours prepared to dig more wells in the event of famine?—Yes.

14. Q. Have they begun to take advances?—They don't get a sufficient amount of takavi.

15. Q. What is the difficulty?—Government only advances up to Rs. 500, and that is not enough to build a well.

16. Q. How much does a well cost in your taluka?—About Rs. 2,000.

17. Q. Is the water very deep?—Water is found at a reasonable depth: a well must be sunk very deep in order to have water always.

18. Q. (Mr. Ibbetson)—How many *mots* are there in a well costing Rs. 2,000?—Six, if water is sufficient. If not, 2 *kos* can do.

19. Q. (The President)—How many feet down is the water surface?—About 15 hands, but in order to make the water perennial, we should go down lower.

20. Q. If you were a little king of your own taluka, what would you do to make it fit to withstand another famine?—If wells were sunk, tanks made and a canal brought in, it would suffice.

21. Q. Are there any tanks now?—There are tanks, but there is no water in them.

22. Q. How are you going to get water in them in a year of drought?—From the rivers.

23. Q. (Mr. Ibbetson)—When you borrowed money from the *bania* to make this well, what interest did you pay?—Six per cent.

24. Q. Do you know whether you will have any additional revenue assessed upon it?—When the survey is revised, I will be charged something extra on account of the well.

25. Q. You say that the tanks were dry in the famine and did not do any good. Could you dig a *kachcha* well in the bed?—Yes; we sank wells in the beds and grew fodder in the famine.

26. Q. (Mr. Rajaratna Mdlr.)—What area does the well irrigate?—Twelve acres.

27. Q. How many *kos*?—Six.

28. Q. How many crops did you raise from that?—One; there was no fodder for the cattle, and I cultivated for the sake of the fodder, but owing to the severe cold it was not good.

29. Q. Are you irrigating a larger area this year?—This year rats have destroyed the crops, and I have not been able to irrigate much.

30. Q. These two years have been rather unfortunate; but do you not think that well cultivation will pay eventually?—Yes.

31. Q. Could a well of six *kos* irrigate a much larger area than 12 acres?—In a good year it will irrigate 20 acres.

32. Q. You said that at the revision of settlement the assessment is likely to be enhanced: have you any idea of the probable amount of the increase?—No.

33. Q. Do you think that the fact of your having dug a well will lead to a greater enhancement of your land as compared with your neighbours' lands where there is no well?—Yes it will.

34. Q. Do you not know that under the rules, there should not be any enhancement?—It will be raised, I think.

35. Q. (Mr. Muir-Mackenzie)—What is the soil of your land?—Black and *gorat*.

36. Q. What is the soil of the land on which the well is built?—*Misri* (mixed.)

37. Q. What crops do you intend to grow in ordinary years?—*Juari*, cotton, and vegetables.

38. Q. Are you going to use well water for cotton?—Cotton will be benefited by well water during such years as this.

39. Q. But in ordinary years?—No.

40. Q. When did you build your well?—In 1900.

41. Q. Has any increase of assessment been yet demanded?—No.

42. Q. Are you afraid that it will be?—Not until the revision of the Settlement.

43. Q. Is that the general fear in the country?—Some people have that fear, but those who know say that will not be the case.

44. Q. Which is the most profitable, rice or cotton?—The people cultivate rice and cotton together; if rice can be irrigated, they get cotton and rice as well.

Mr. Ali
Akbar.

9 Dec. 01

WITNESS No. 25.—MR. ALI AKBAR, Executive Engineer, Surat and Broach.

Answers to printed questions.

I.

SURAT AND BROACH DISTRICTS.

2. Culturable and Irrigable Areas, etc.

	Gross Area.	Culturable.	Area under Tank Irrigation (Government).
	Acres.	Acres.	Acres.
Surat . . .	1,058,423	825,372	12,362
Broach . . .	938,791	692,630	950

Rainfall.

	Average of twenty years, 1881- 1900.	Maximum.	Minimum.
	In. c.	In. c.	In. c.
<i>Surat</i>			
Chorasi Taluka .	42 56	In 1894 65 03	In 1899 18 40
Olpad do. .	35 30	„ 1894 52 90	„ 1899 11 22
Bardoli do. .	54 16	„ 1894 73 63	„ 1899 17 62
Mandvi do. .	54 06	„ 1883 80 35	„ 1899 12 95
Chikhli do. .	67 09	„ 1883 109 32	„ 1899 24 43
Jalalporo do. .	52 19	„ 1884 82 31	„ 1899 24 35
Bulsar do. .	65 67	„ 1883 90 59	„ 1899 36 97
Pardi do. .	74 61	„ 1892 111 09	„ 1899 31 16
<i>Broach.</i>			
Broach Taluka .	41 87	In 1896 69 99	In 1899 10 61
Amod do. .	36 49	„ 1894 67 05	„ 1899 4 50
Jambusar do. .	34 53	„ 1894 65 62	„ 1899 7 35
Vagra do. .	31 32	„ 1894 54 77	„ 1899 5 16
Ankleshvar do. .	38 64	„ 1891 61 59	„ 1899 12 28
Hansot do. .	32 07	„ 1891 52 74	„ 1899 9 87

Surat is an important rice-growing district. Rice cultivation is dependent on tank irrigation, and there is a demand for water throughout the monsoon. In Broach (except the Ankleshvar Taluka, which in its agricultural features resembles Surat), there is no demand for water during monsoon. Rice requires two to three floodings between June and October. The last flooding is most important, because it ensures a good harvest of rice and a second crop of val. The distribution is controlled by arrangement amongst the villagers themselves. The irrigation revenue is realized in the form of increased land assessment and is in the proportion of 10 of land share to 4 of irrigation (water) share.

3. *Black Cotton Soil.*—Small tanks constructed in black soil hold water very well. Existing dams are of this soil without masonry core-wallings, and I think high dams could be made of it, provided they are protected by yellow earth or mooram covering. Black soil cracks when dry, but is very retentive when wet. Surface protection would, therefore, tend to keep it moist. As yellow and kunker soil is always obtainable at varying depths below the black soil, there would be no difficulty in providing the surface covering of a depth of two to three feet. There is always demand for water during the monsoon as described above. The area of irrigation under each tank being fixed, there is practically a constant and uniform demand. The assessment being also fixed, there is no variation in revenue. Broadly speaking, and excluding patches of sugar cane, I believe the tanks do not command other classes of soil nor irrigate other crops than rice. There is a tendency on the

part of the people of Surat District to extend rice cultivation from tanks, but such is not the case in Broach. I think their extension would be very useful and remunerative.

4. *Government Irrigation Works.*—No works of the kind have either been constructed or are in progress in these two districts. Tapti Irrigation canal was the only work which was proposed before the last famine (1899-1900), but since then two projects, namely, “Untewa” and “Amba Pardi” tanks in the Mandvi Taluka, have been drawn up, and although every endeavour has been made to find out fresh tank sites, it has not proved successful. Detailed information and estimates in connection with these projects have been supplied to Mr. Beale, specially appointed for this purpose, and I understand he has dealt fully with the matter; but I give below my views regarding irrigation from the Nerbudda and Tapti. Deep black cotton soil forms the bulk of the two districts. It is a well-known fact that this soil is not suitable for irrigation. Rice is the only kind of irrigated crop which at present flourishes in certain favourably situated small areas, and it requires copious water-supply for flooding during the monsoon months (June to October) only. It also requires a good deal of manure which would not be available for irrigation of extensive areas. Cotton and jowar are the two crops which are grown very extensively. For both these crops the soil is extremely suitable, and specially so in the case of cotton, which thrives in spite of great variation and uncertainty of rainfall. This I can assert from the experience of this year, as although the rains held off since “August” cotton has not suffered to any great extent. Jowari has suffered somewhat more, but still both these crops are expected to give fair results, unless the plague of rats which has already caused a good deal of damage would cause further destruction.

The danger of water-logging and consequent effect upon the healthiness of the climate of the large areas to be brought under irrigation is also a factor which requires serious consideration. For the above reasons, and the facts that the soil is best suited to jirayat cultivation and the general immunity enjoyed by the districts from serious famines, I would hesitate to recommend the waters of Nerbudda and Tapti being utilized for irrigation. The works would be very costly and of doubtful utility.

5. *Provincial Irrigation Works.*—We have no such works.

6. *District or Village Works.*—Statistical and general information has been supplied to Mr. Beale and I see no good in repeating it here. I should, however, like to say a few words about their usefulness and possibility of extension from personal experience. Almost every village has a tank of some kind or other from which in many cases little areas of irrigation are practised. If these tanks are carefully examined and such as appear promising are surveyed, I have no doubt that several tanks will be found which can be enlarged by building *pukka* waste weirs or self-acting sluices at the inlet so as to raise their full supply level. A systematic and careful survey of every tank by a special staff is necessary before any definite conclusion can be arrived at as to the extent to which extension would be possible. I have observed that in several cases the inlet channel is overtopped after the tank is full, and in the surrounding fields water lies to a depth of 2 to 3 feet, and gradually drains off into some adjoining nallah. If self-acting sluices are constructed as stated above and water is impounded in the tank up to the highest level it has reached, I am sure the capacity could be considerably increased. Leaving aside the question of irrigation, these tanks are of the greatest value as protection against drought and ensuring good drinkable water-supply to the villages. In the Broach District irrigation from tanks is very limited, but during the last famine several tanks were largely excavated and enlarged. In the monsoon before last every one of them was reported to have completely filled. In the monsoon just past they did not quite fill, but are holding very fair quantity of water. Two or three cases have come to my knowledge where water-supply from wells was formerly brackish, but last hot weather it had very much improved. Extension and enlargement of tanks are therefore in my opinion the most useful form of protective works we have in these districts.

7. *Wells.*—I have supplied whatever information I had to Mr. Beale, from which report I quote below paragraph 3, which formulates my opinion about the extension of irrigation by wells.

"Paragraph 3—As for extension of irrigation of wells, I would not advise its being undertaken on any large scale by Government. It is a well-known fact that the black cotton soil, which forms the bulk in both the districts, is not suitable for any other kind of irrigation except rice, and rice requires copious water-supply. As famine protective works, these wells would be of very little use either. The expense would be out of all proportion to the good that would result. In the black soil tracts the wells do not contain abundant supply of water, and in a bad year the supply would dwindle down to such a small quantity that barely an acre could be irrigated from it. Water would often become brackish and even salt, which is useless for irrigation."

8. *Drainage Works.*—All the drainage works that were known to be required have been carried out with the exception of Olpad drainage works, about the utility and desirability of which further enquiry is necessary. There is a general impression in Broach, and I have been told by some villagers that by the construction of these drainage works the surface soil, which acts as manure, has been washed away and injury has been caused to the land. But this is a matter about which I am not in a position to form an opinion from personal knowledge.

9. Works executed by Famine labour.—

Classification.

Name of work.	Amount expended.	
	Surat.	Broach.
	Rs.	Rs.
Drainage channels	454	1,07,554
Village Irrigation tanks	2,41,015	2,77,460
Reclamations . . . . .	...	1,04,413
Village tanks	22,244	18,60,853
Roads, earth work . . . . .	...	98,335
Collecting metal	442	12,161
Total	2,64,155	24,60,779

All the works which remained uncompleted at the end of famine and which it was considered desirable to complete, have since been either completed or are in progress, and provision of funds has been made for them. I have already discussed the advantages which have accrued from the village tanks in paragraph 6. In every case tanks filled up to F. S. L. in the monsoon of 1900. Absorption was rather rapid in the first year, but it has reduced this year.

10. *Programme of Relief Works.*—Revised famine programme has been published which gives detailed information.

I summarise the figures below :

		NUMBER THAT CAN BE EMPLOYED FOR SIX MONTHS.			
		Sanctioned works.		Proposed works.	
		Tanks.	Others.	Tanks.	Others.
<i>Broach District.</i>					
Broach Taluka		6,269	771	22,220	977
Amod do.		13,267	2,196	27,554	1,244
Jambusar do.		8,108	2,499	39,998	1,054
Vagra do.		20,883	3,187	8,888	...
Ankleshvar do.		18,742	1,648	19,993	...
TOTAL		67,269	10,299	118,658	3,275
<i>Surat District.</i>					
Mandvi Taluka		6,828	...	8,931	...
Olpad do.		9,969	...	10,155	...
Bardoli do.		8,019	...	...	...
Chorasai do.		2,311	...	...	...
Jalalpur do.		14,450	...	10,936	...
Chikhli do.		9,152	...	9,032	...
Bulsar do.		12,543	...	4,644	...
Pardi do.		9,600	...	5,608	...
TOTAL		72,872	...	49,366	...

It will be observed that tank excavation is the principal item in the programme and that the works are well distributed. The programme can be extended with ease when

required, as an estimate for tank excavation takes very little time to prepare.

II.

A.—General.

1. Surat and Broach Districts.—I have been in charge for the last three years, and had to make arrangements for the supply of water in the famine.

2. The average rainfall is as under:—

Month.	Broach.	Surat.
January	0.05	0.04
February	0.07	0.10
March	0.01	...
April . . . . .	...	...
May	0.07	0.12
June	6.35	10.71
July	14.90	24.00
August	7.24	10.82
September	5.63	8.46
October	1.42	1.62
November	0.11	0.15
December	0.02	0.03
Average per year	35.87	56.05

4. Unsuitability of soil has already been discussed in replying to the Memorandum of Points, paragraph 3 and 4.

5. Uncertainty and insufficiency of supply of water in tanks is the obstacle, not only in the way of extension but also in the success of the existing irrigation. More especially the early cessation of rain does the most harm, as it prevents the full yield of the rice crop and the second crop cannot be grown.

B. and C.

We have no such works.

D.—Tanks.

23. (1) All the tanks in the Surat and Broach Districts get their water-supply from the rainfall on the catchment area.

(2) By pipe outlets through the dam in different parts.

(3) The supply is required from June to October. In the years of ample rainfall it is sufficient, but when water is felt towards the end in years of scanty rainfall.

(4) The variations in the areas irrigated from tanks are very great. The area varies according to capacity of the tank, the area commanded and whether the tank is used for domestic purposes or not.

An average irrigation tank irrigates about 10 acres.

24. I can only answer these questions recently. The principal unirrigated crops grown are *jowar* and *barley*, these are grown alternately and their value is about Rs. 15, cotton Rs. 25, or an average of, say, Rs. 20 per acre. Assessment being Rs. 3 to Rs. 3.50 per acre, the principal irrigation crop from tanks, and on the whole, *val* is sown after October. The yield is Rs. 17 for *val* and Rs. 13 for *val*, or a total of Rs. 50 per acre. Enhanced assessment on such lands averages Rs. 14 (Rs. 10 and share and Rs. 4 irrigation or water share), and is collected by the Revenue Department.

26. The only instances I know are small areas of sugarcane in the Jalalpur and Bulsar Talukas of Surat District, where water is supplemented from wells after the tanks are empty.

28. The owner of the land pays revenue to Government. The amount, etc., is stated in paragraph 24. The assessed rate of assessment is paid on the total area of the holding and is not dependent on the area actually irrigated.

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30. The tanks are all in charge of the Revenue Department and are only periodically repaired on a requisition from the Collector by this department. The expenditure is confined (except under special sanction of Government) to 10 times the irrigation share and subject to condition that the villagers contribute 10 per cent. of this amount. The system is working well. The question of enlargement and extension of irrigation I have dealt with in my former report.

33. There is no doubt that slow silting of tanks is going on, and consequently the capacity is being reduced, but there are no statistics of accumulation. There is no custom of regularly removing silt, but excavation is made at the time of periodical repairs to the extent required for repairing the bank.

E.—Wells.

The average depth varies from 40 to 60 feet, but observations are being taken in different parts of the districts.

1. Q. (The President.)—You are Executive Engineer of the Districts of Surat and Broach?—Yes.

2. Q. How long have you held that post?—About 3½ years.

3. Q. Were you in these districts throughout the famine?—Yes.

4. Q. Can you say roughly what was the loss of population during the famine?—I cannot say.

5. Q. Is the country in Broach not adapted to the formation of tanks?—We cannot get water by flow from tanks so easily as in Surat, owing to the flatness of the country.

6. Q. Is the country flatter in Broach than in Surat?—Yes.

7. Q. What is the procedure in Surat, as regards repairs of tanks?—We generally take up the tanks that are in want of repairs in the order of their importance; those that irrigate a large area we take up first.

8. Q. You have not an establishment sufficient to go round and inspect them?—No, the tanks are in charge of the Revenue Department.

9. Q. A tank might be in very bad order and you might not hear about it?—I should think the villagers would very soon tell the Collector.

10. Q. Did not tanks do good during the famine?—Rice was grown under them, and in some *talukas* there was material good done; in places where there was not sufficient rainfall the crops died.

11. Q. Did they turn to the wells to help them?—Not in the irrigated area but in the tank bed itself, *kachcha* wells were dug and fodder crops grown to some extent.

12. Q. You say "there is a tendency on the part of the people of Surat District to extend rice cultivation from tanks, but such is not the case in Broach. I think their extension would be very remunerative." You think there are places in Broach where tanks should be made?—That is my impression.

13. Q. Has no survey been made?—No.

14. Q. Will you tell us something about this tank at Broach that we saw?—For the last 20 years there has been a question of the water-supply to Broach from the Nerbudda and also from wells; this project was first thought of by Mr. Fardunjee, Executive Engineer, who was for a long time in this district. He was here before the famine and got me to level the ground; we saw that there was a great deal of work wanted, we wanted a large central work for the famine and had no alternative, so this survey was hurriedly commenced.

15. Q. There has been no mistake about the levels?—No, but the revenue prospects and details were not considered carefully.

16. Q. Did the Collector, Mr. Cadell, approve of it?—Yes.

17. Q. Did the people themselves show any interest in the Broach reservoir?—No.

18. Q. There was no idea of irrigating from the tank?—No. It was intended for the water-supply of Broach, we could not make it sufficiently deep, the original project was for 20 feet of water, after percolation 15 feet would remain, that was considered sufficient for supplying the low-lying parts of Broach.

The cost of a *pakka* well having steining of burnt brick and lime masonry is from Rs. 500 to Rs. 1,000, and its diameter from 6 to 10 feet; *kachcha* wells are not practicable and seldom found anywhere.

The wells of the kind described above are so limited and so little irrigation is practised from them, that it may be said to be a negligible quantity. There are certain limited tracts of what may be called natural bagayat lands where favourable condition for well irrigation exists. There is copious supply of water at the shallow depth of about 25 feet, and a well of 6 feet diameter can be constructed at a cost of Rs. 300 only, and would irrigate from 2 to 3 acres of sugar-cane or garden produce. Such areas of bagayat lands occur on river sides and near nallah, and cultivation in them is intensive and requires no help from Government in the way of construction. The bagayat area of the kind mentioned above is extremely limited and does not affect the general question of well irrigation.

The question of extension of irrigation by wells I have already dealt with in my former report.

19. Q. It will hold water in an ordinary year?—After precolation and evaporation there will not be more than 3 feet of water, and that will not be sufficient for the water-supply scheme.

20. Q. If you had proper outlets, would there be any demand for water for markets and gardens?—Yes, that is my impression after talking with people about it.

21. Q. How much money would you require?—Rupees 8,000 would do it.

22. Q. You do not think that there would be an advantage in employing the waters of the Nerbudda and Tapi for irrigation?—I cannot say I have studied the question, but that is my impression.

23. Q. Owing to the nature of the soil?—Yes.

24. Q. Has any estimate been made of the cost of a survey for sites of small tanks?—No, I have not done any surveys.

25. Q. Would you carry on such works before the famine came or would you leave them till then?—They would not be suitable for famine labour; they should be done as ordinary works. Tanks are the best form of protection. I would improve existing tanks by providing sluices. This should be done at once.

26. Q. You say "all the drainage works that were known to be required have been carried out with the exception of Olpad drainage works, about the utility and desirability of which further enquiry is necessary." Have you worked out the Olpad project?—Yes, in detail.

27. Q. What is the estimate, roughly?—I cannot remember.

28. Q. Have you any doubt about the benefit of it?—If we drain it slowly, as we propose, I think it will do good.

29. Q. What is the slope of your drainage channel?—1 in 1,700.

30. Q. You say the feeling is against carrying out the work?—Yes, some villagers have asked me to apply to the Collector to prevent it being carried out.

31. Q. Why is that?—There is not sufficient water, they want more.

32. Q. Supposing you put a sluice in the drain, wouldn't that help matters?—Yes, but it would be a little more costly perhaps, as we have only one bridge.

33. Q. Would the drains remain full for very long?—At the worst perhaps four days; they are designed to carry off 1 inch of rain per day.

34. Q. You say that "the tanks filled up to F. S. L. in the monsoon of 1900"?—Yes, I particularly referred to tanks excavated at the famine time.

35. Q. They did not work?—They did not quite fill but they did some service, please see section 6 of my note.

36. Q. Do you know of any places in your district where water should be stored on a large scale?—No, before the famine we had a council consisting of the Superintending Engineer, Commissioner, Collector and some local authorities like the Hon'ble Mr. Chuni Lal, and tried to find works of that description, but no one could suggest any; the flatness of the country is against it.

37. Q. (Mr. Higham).—Would it be any good to have a survey of the country in greater detail with a view to finding sites for big tanks?—I don't think we shall be able

to find many sites of that description ; by big tanks I mean such as have dams of some height.

38. Q. You propose one tank in Surat?—Two.

39. Q. One of them has been surveyed?—Both have been surveyed.

40. Q. Have they been sanctioned?—No.

41. Q. What will they cost?—I think one will cost a little over Rs. 3,00,000 and one about Rs. 1,00,000. They are alternative schemes for one and the same tank.

42. Q. What will they hold, roughly?—380 million cubic feet in good years.

43. Q. Is that the only project you have been able to recommend?—Yes.

44. Q. It is no use surveying for more?—No, you might find small ones.

45. Q. I don't understand what you want a survey for, what is the point?—We want to find out to what extent we can raise the full supply level and improve existing tanks.

46. Q. (The President.)—You merely want an accurate plan of a tank before you begin work upon it?—Yes, we have no information at all as to the drainage area, contents, etc.

47. Q. (Mr. Higham.)—I suppose you know how high the tanks are filled, it seems to me that much time is wasted in making surveys, the object of which I don't understand ; either the dams are too high or they are too low, cannot you raise them or lower them without making a survey?—These surveys won't take long, perhaps two or three days at the most.

48. Q. In regard to drains, you would limit the run off to one inch in 24 hours. Would not that be too fast ; the complaint is that these drains take off too much water in dry years when you want the water?—One inch would be too fast to take off, if we wanted to stop it we could put in a regulator ; at present these areas, which we propose to drain, are very much water-logged. The existing drains were not designed for any particular run off. With scanty rainfall perhaps one inch per day would be too large.

49. Q. You propose to make regulators?—I have not been able to form a definite opinion.

50. Q. Why cannot the people control the water themselves ; don't they have banks running through their fields?—No.

51. Q. The complaint is that the water carries off the surface soil, a regulator won't stop that, it seems to me that the only plan is to hold the water in the field by bank until they get what they want?—Yes, no doubt.

52. Q. Can the engineers stop the drains being too effective?—We can stop the flow by regulators, this would check the water going into the drain.

53. Q. How deep is the drain below the surface?—Two to 3 feet ; further down, out of the water-logged area, it is deeper.

54. Q. Could you not hold up the water by bunds?—Yes it would require an establishment ; we would require establishment for regulators too.

55. Q. You have designed some new drains, are they going to be constructed?—The project has not been decided yet, none of the Revenue Officers have been asked yet about it.

56. Q. With regard to the Tapti canal, is there room for both the canal and drainage works, won't the canal intensify the present water-logging?—It probably would.

57. Q. You say the Broach tank was made for the water-supply of the town ; is there any reason why it cannot be deepened to the depth to which it was originally designed?—Yes ; if more famine work was required ; no doubt they would require to take the water out of it, there is water in it just now.

58. Q. It was designed to be 12 feet deeper than it is at present?—Yes.

59. Q. What is the soil?—Yellow clay.

60. Q. If you went on, you would not get through the clay bottom?—No.

61. Q. Is there any idea of continuing operations?—Only in the case of a large famine.

62. Q. If cleared to its full depth, would it be sufficient for the water-supply of Broach?—Yes, it is calculated that it would.

63. Q. Supposing you have a dry year?—It would have sufficient water for the next year.

64. Q. You have spent nearly 19 lakhs on these tanks in the Broach District. This tank in Broach cost only 4 to 5 lakhs?—Yes.

65. Q. Where are the other tanks?—There are about 27 tanks in different parts of the district.

66. Q. None of them were intended for irrigation?—Very few.

67. Q. They are village tanks?—They are only for domestic supply, on a few we hope some irrigation will be possible, but they are small.

68. Q. You could not find irrigation tanks in Broach?—No, they are below the ground level, they are simply hollows in the ground and would require lifts.

69. Q. You could not find sites for flow irrigation?—No.

70. Q. (Mr. Ibbetson.)—How long have you known these parts?—For 3½ years.

71. Q. Do you work the 10 per cent. contribution rule in regard to the repairs of private tanks?—Yes.

72. Q. Supposing a village does not give 10 per cent. ?—We submit the papers to Government and very often the Collector gets it from the Local Fund.

73. Q. I cannot understand about the survey for new sites for tanks, I understand no sites are available for big tanks ; putting that aside, do you recommend new sites for small tanks?—I think enlarging of existing tanks would be more useful.

74. Q. You don't think it would be worthwhile to look for sites for new tanks?—No.

75. Q. Rice is grown without irrigation?—No rice is grown, except when it is mixed with cotton, then it is grown without irrigation. I believe in Broach there is rice mixed with cotton on dry areas, but only in limited areas.

76. Q. You say that rice requires a good deal of manure which is not available, and that this limits the extension of cultivation ; is rice never grown without manure in these districts, or do you mean that without manure rice won't pay a water-rate?—The crop would not be worth growing.

77. Q. Is there any *rabi* grown in these parts besides the second crop on rice land?—Cotton only.

78. Q. No wheat or barley?—I don't think so.

79. Q. As regards the improvement of the small tanks which you propose, do you think Government would get a return on the money spent?—Yes, certainly ; if we increase the water-supply, they will grow cane.

80. Q. Would you get more revenue from that?—The assessment would probably be higher.

81. Q. Would you bring new land under irrigation?—In some cases it would be possible, but as a rule it would not be the case.

82. Q. You would only improve the supply to the existing area?—Yes.

83. Q. Would the Government get extra revenue sufficient to give them a fair return?—I cannot say.

84. Q. With reference to what you say in paragraph 24, we have been told by some witnesses that the credit allowed to water is not sufficient?—I think it should be larger.

85. Q. In the case you quote, do you think that instead of taking Rs. 4 out of Rs. 14 as the irrigation or water share you might take Rs. 10 out of Rs. 14?—Yes, Rs. 10 as irrigation share and Rs. 4 as land share in order to be fair.

86. Q. There are a number of small tanks which Government cannot put into order ; supposing Government made over the water revenue to Local Boards, could they put the tanks into order?—Yes, if they got a better professional establishment.

87. Q. Do you think that the agency could be improved?—I should certainly prefer that they should be done under the supervision of the Public Works Department.

88. Q. Supposing Government said these tanks are too small for us to repair ; rather than let them go altogether, would it be a good thing to use the agency of Local Boards ; if they were given the revenue, would they do the work fairly well?—Yes.

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89. Q. Is there any hope of getting the people to do it themselves?—No.

90. Q. (Mr. Higham).—Do you think Local Boards would do it better than District Revenue Officers?—It means it would be under the District Revenue Officers.

91. Q. (Mr. Ibbetson).—I understand that there has practically been no famine in Surat?—No.

92. Q. In Broach?—There was bad famine there.

93. Q. Are you supposed to keep up a famine programme in Surat?—Yes.

94. Q. Is it ready?—Yes.

95. Q. You state in your programme the number of people for which labour is provided, have you any standard with which to compare that number, to see if it is sufficient or not?—That is kept by the Collector.

96. Q. Have you maps showing the distribution of works?—Yes.

97. Q. Are they printed?—No.

98. Q. The works might all be in one corner of the taluka?—Perhaps, but the talukas are small.

99. Q. Does your programme include village works?—No.

100. Q. Why is that?—The village programme is kept by the Collector.

101. Q. Do you know anything about it?—The Collector selects the village tanks and estimates are got out.

102. Q. As far as famine works go you are ready?—Yes.

103. Q. And the larger public works schemes are ready?—Yes.

104. Q. (Mr. Rajaratna Mdlr).—I was told at Broach that the level of the town is much higher than the level of the tank. Is that correct?—Some parts are.

105. Q. The greater portion, I was told?—About one-third at least is lower, we could give water by flow if we had it.

106. Q. Two-thirds of the town would require it to be pumped?—Yes.

107. Q. Considering the nature of surrounding soil (black cotton) will not the tank get silted up soon; and what area will it irrigate in its present condition?—The tank will not silt up so rapidly, it would irrigate about 600 areas by lift, not by direct flow.

108. Q. Could you pump water in that soil without reservoirs and filters?—Wells would be made and it would be pumped from them to prevent dust getting into the pumps—not deep wells.

109. Q. How many millions does this reservoir hold?—21 millions.

110. Q. What is the area under rice in Surat?—11,000 acres, the total irrigation is 125,000.

111. Q. Has there been any appreciable increase in the rice area in the last ten years?—No. I don't think so.

112. Q. You said in reply to Mr. Ibbetson that two or three days would suffice for the survey of each tank?—Yes.

113. Q. Is not the existing staff capable of carrying out such a survey?—Our establishment at present is just enough for ordinary works; it would require good trained men.

114. Q. Overseers would be sufficient?—Yes.

115. Q. You also said in reply to Mr. Ibbetson that the return on some of the works even after repair would be very little; supposing Government derived no increased revenue from these tanks, would you not still advocate their thorough repair to prevent further deterioration?—It would be a useful work.

116. Q. Apart from famine considerations, considering the present condition of the tanks?—Yes, I do not

recommend these repairs only; but extensions and enlargement of the tanks.

117. Q. Do you think it would be economical to pump water from the Nerbudda and supply it for purposes of irrigation?—I think it would be too costly.

118. Q. Supposing masonry banks were constructed for the erection of *mats*, would that be cheaper?—I think it would cost a great deal.

119. Q. What is the rise of the Nerbudda on the average?—16 feet, there is a difficulty about salt water.

120. Q. Does the tide go high up?—About 10 miles above Broach itself.

121. Q. (Mr. Muir Mackenzie).—Do you believe rice cultivation could be largely extended in Broach by means of tanks?—At present the cultivators are not inclined to do it, if a good supply of water were given, they might be induced to.

122. Q. Would it be more profitable than cotton?—I cannot say.

123. Q. You say "the area of irrigation under each tank being fixed, there is practically a constant and uniform demand." Do you mean that a larger area might be irrigated by tanks?—In some cases it might be.

124. Q. How do you mean it is fixed?—The water is only given to a certain fixed area.

125. Q. (The President).—Do you mean if a tank one year had twice as much as another, the area would still be the same?—Yes, the surplus water is used for domestic purposes.

126. Q. (Mr. Muir Mackenzie).—Are there many other sites on which tanks could be made?—I don't think there are.

127. Q. I mean as regards Surat as well as Broach?—No.

128. Q. Do villagers sometimes apply to have new tanks made?—No.

129. Q. I heard of an application the other day?—Such cases would be very rare.

130. Q. (The President).—Would the people in Surat like more?—They would like better tanks.

131. Q. (Mr. Muir Mackenzie).—You don't think it would be worth making a survey to find sites?—I don't think it would be possible to find many sites even after a survey was made.

132. Q. You gave me the impression that you thought most of the rice irrigation was under tanks, but there is plenty under *Akashia*?—I don't know.

133. Q. In Chikli there were at the original survey 8,221 acres of rice, do you believe that that is almost all under tank?—In Chikli taluka the circumstances are peculiar; I only refer to irrigation rice.

134. Q. In Broach it is true that except under tanks there is very little rice except when mixed with cotton?—Except in Anklesar there are many places in which rice under rain water is grown.

135. Q. Do you know if any advantage might be derived in water-logged areas by making tanks within them and leading drains into these tanks?—Yes.

136. Q. (The President).—Do you think the levels would admit of that?—It would be simply excavating a hole in the ground.

137. Q. (Mr. Muir Mackenzie).—Do they lift water from tanks here?—No, except for sugar-cane.

138. Q. Do these drains silt at all?—Yes, when there is back-water in the stream into which they fall.

139. Q. You know nothing of the injury to the surface soil?—No, I have not seen it, I have only heard of it.

WITNESS No. 26.—DESAI DULABHRAM SAMBHRAM, Land-owner.

Answers to printed questions.
I.

Mr. D. D.
Sambhram.

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Paragraph 2.—I do not know the area of culturable lands in each district. This can be obtained from the district records. As the rainfall is deficient in Gujrat, the crops do not grow properly. Rice crop in husk requires to be irrigated. Rice crop requires at least water five times.

The rain should fall in the months of Akhad, Shravin, Bhadava and also at intervals for the rice crops. Revenue is not recovered as there are no irrigation works.

Paragraph 3.—Small tanks excavated in black soil cannot hold water. Black soil does not require to be irrigated,

if there be sufficient rain. Gorat land can be better benefited by irrigation than the black soil. If there be sufficient rainfall the owners of the black soil do not require irrigation. But if the rain is not sufficient they require the aid of irrigation in raising their crops. Tanks excavated in black-soil do not hold water. Tanks in such lands should be excavated very deep and when the bed becomes solid it holds water.

4. Now the irrigation works are not going on in this district. It would be beneficial if in the famine year these works are opened. The water of the river Nerbudda becomes brackish as far as Sukaltirath and beyond that the water of this river remains always sweet. If a channel be from the place where the water remains always sweet, or if the water be brought from the Tapti river irrigation works can be advantageously utilized. There are no other big rivers besides these two. I have not the accounts of cost incurred after repairing the irrigation works. These can be had from the Taluka Officers.

5. Rice lands near old tanks have already been charged Himayat; hence no other assessment is levied. I do not know of any increase in revenue owing to the construction of irrigation works. If higher rates are levied on tanks to be constructed hereafter the people will feel them to be a burden. Provincial funds should be utilized in constructing irrigation works; or new works may be built at Imperial expenses. Provincial rates are insufficient to meet such expenses, Government money may be used for the purpose.

6. Village and district works are executed by the Civil agency or by the Public Works Department and the works are supervised by the Revenue officers. I have no records to show how much land depend on these works and how many such works are in existence. The water-rate is according to the original settlement credited to Government Revenues, and hence these works should be constructed at the expense of Government. Government has not to spend money every year. People apply to Government when their village tanks are silted up and after due enquiry Government repairs or deepens such tanks. Government do not remit the water-rate even if such necessary repairs are not made. Tanks and reclamation works have been done in the famine year, and I know not of other works. Such works were not undertaken by private individuals but they were made by the District Board. Government should undertake the works for which they realize the water-rates and the District Board should provide money for the tank which are used by the people for drinking water. I do not know that Government have given loans for these works. If such works are constructed for the benefit of the people they are sure to be pleased. If responsibility for such works were put on the people, nothing can be done or will be done. People cannot undertake such works.

7. I do not know the area of lands brought under cultivation in the ordinary years and in the famine year.

I have no records to show the number of new wells constructed each year during the last ten years. Government advanced a ony to the people to construct wells but I have no accounts to show the exact amount advanced. It is advantageous to spend money in constructing wells in the lands fit for Bagayat. During the famine years, i.e., 1899 to 1901, people managed to dig *karchha* wells. I do not know of old wells having been repaired. Water can be found in the villages of Diva, Divi, Survadi, Samoi, Andada, Chikara, Mandva—Buzrag, Ankleshvar and Chorasi at a depth of 20 feet and the well should contain 20 feet of water, and thus the total depth of the well can be fixed at 40 feet. In other villages water can be obtained at a depth of 30 feet and the well should have in it 20 feet of water, and thus the total depth of the well can come to 50 feet. The cost of a well having one *kos* can come to Rs. 500 and a well of two *kos* Rs. 700 and of four *kos* Rs. 1,000.

8. Excessive rain makes the low lying lands water-logged and by the incessant flow of water the land is washed away. Drainage works are required at a few places. For such works Government should provide money for improving the lands. Increase in Government revenue can be made by bringing the waste lands under cultivation; and if the land is free from being water-logged, the crop would thrive and the Government revenue can be realized.

9. I have no records to show the number of works undertaken during the famine year. Ankleshvar tank was excavated during the last famine, but no 'Ovara' has been constructed, and hence the people experience some little difficulty. People are benefited by this tank. Owing to the excavation of the tank it holds water and consequently the people and cattle have ample water to drink.

10. I do not know.

II.

A.—General.

1. The following answers are applicable to the Broach District.

I have served as a talati for 43 years, and by experience I know this.

2. From January to the 15th June the rainfall is very slight and from 16th June to 30th June the rainfall is 10 inches, in July 20, in August 10, in September 8, and in October 4.

3. There are obstacles enumerated from 1 to 8 in the extension of irrigation.

4. I know of no man exempted from enhancement of assessment of water-rate for the irrigation work constructed from private funds.

5. People do not take loans freely for the extension of the irrigation.

Reduction in the rate of interest, remission of interest cannot induce the people to extend irrigation, if partial remission is allowed out of the sum advanced, wells may be dug in lands which are fit for Bagayat. But in case the water of the well turns out to be brackish, the expense should be borne by Government. Period of repayment of instalments should be extended by accepting a fit person for the surety. I do not fear that the extension of irrigation will injure the remaining cultivation by drawing cultivators to the irrigated tracts. I know not of having such a case occurred previously.

D.—Tanks.

23. 1. The tanks are filled in by rain water.

2. Kiari lands are sown with rice crops. Water is filled in the kiari lands by cutting a small channel from the tank. If the water in the tank is not sufficient for a flow by channel, cultivators use pots for supplying water.

3. If a rainfall is scanty the water would last for four months of the monsoon, and if the tank is dug very deep the water may last for eight months. In large tanks the water would remain for 12 months. In the famine year the rainfall being scanty tanks would not hold any water; but if any does find its way into the tank, it would last only for a month or two.

24. The assessment on irrigated lands can be raised by Rs. 2 per acre.

1. By getting two harvests instead of one, the assessment can be raised by Rs. 2.

2. Valuable crops cannot be raised in black soil. Cotton, juar and wheat can be sown in the black soil, and therefore no enhanced assessment can be levied.

3. In a year of ample rainfall, scanty rainfall or drought no increase in yield can be obtained, but timely rainfall would bring the proper harvest.

25. Late commencement would not bring a proper harvest and may affect the outcome. Early commencement cannot have such an effect and may be useful.

26. If a land is irrigated by means of water from the well and in a tract in which sufficient and timely rainfall has moistured the land, the harvest accruing from the land watered by rain would be superior to the irrigated crop.

27. On the average, in a normal year or in a year of drought, the increase per acre of irrigated lands would come to Rs. 20 in a year of ordinary rainfall as also in a year of drought.

28. The cultivator and the owner of lands together would pay Rs. 2 more per acre per annum.

If the owner of the land pay the increased rate he would recover that amount from his tenant.

The enhanced water-rate is levied in the ordinary year or in the year of drought without regard being had for the actual area irrigated. The water-rate is fixed on the land and that is recovered.

29. The owner of the land incurs the expenditure required in bringing water to the field and in some cases the tenant if the condition is included in the "Ganotpata".

30. The expenditure on the excavation to the tank is borne by Government and the people having (kiari) rice land generally subscribe a part, but the greater part of the expense is borne by Government. Repairs are not required every year, and Government repairs the tanks if the rayats apply for it. It is not possible to ascertain the approximate annual cost per acre.

Mr. D. D.
Sambharam.

9 Dec. 01.

Mr. D. D. Sambhuram. 31. If a tank is constructed by a private person he may charge to others what water-rate as he likes, and I know of no quarrel having taken place in this respect.

9 Dec. 01. 32. No private person can construct tanks if encouraged or assisted.

33. Tanks are not cleansed every year, nor are they excavated every year. The tank should be deepened 3 feet deep. Government excavates or repairs the tanks. People sometimes deepen tanks by manual labour. I know of no case occurred where the whole tank was cleansed after it was once filled in with water.

34. The Broach district comprises of five talukas and one Peta Mahal. The names are Broach, Wagra, Amod, Jam-basar, Ankleshwar and Hansot Mahal.

The average depth of permanent wells in Ankleshwar Taluka varies from 40 to 50 feet and in Broach and other talukas it varies from 60 to 70 feet. The water in many of the wells is supplied from springs, and water thus supplied lasts for a long time. The water supplied by percolation does not last long. In ordinary years the water of the wells does not become saline, and in the famine years the water fails and becomes saline.

The cost of the well having one *kos* would come to Rs. 500, Rs. 700 for two *kos* and Rs. 1,000 for more. A well can be constructed within two to four months. If a well is excavated deep and if good springs would be reached, water would be abundant.

A well having 1 *kos* can irrigate 1 acre of land and a well of 2 *kos* can irrigate 4 acres of land. Thus 1 *kos* irri-

gates 2 acres. I have no record to show the average area irrigated in one year.

35. *Vide* answer to paragraph 24.

36. *Vide* answer to paragraph 27.

37. I have no record to show the approximate average annual rate per acre paid on account of irrigation. It will be known from district records. The cultivator pays to Government as water-rate what additional produce he gets by irrigation. The land under a well is charged *Himayet* according to a certain rate per acre, and the rate is levied from the whole whether the whole of it is irrigated or not during the year.

38. Difficulties are often encountered in finding out water spots; besides without reaching water it cannot be determined whether there will be sweet or brackish water. Similar difficulties are experienced in constructing the superstructure. I do not know of assistance or advice being given in this respect by Government.

39. In private property it is not necessary to construct well without the permission of the owners.

40. In a famine year temporary wells can be excavated and by these temporary wells harvest can be raised.

41. It is proper to levy some water rate from wells constructed in Bagayat lands in case of insufficient rainfall. Wells should be got constructed by advancing *takavi* to rayats free of interest and repayable in instalments. If *jirayat* land is thus converted into Bagayat land, it should be settled what rate to levy on such wells.

1. Q. (*The President*).—(Through an Interpreter).—Are you a landowner?—Yes.

2. Q. How much land do you own?—About 200 acres.

3. Q. Is your land irrigated or not?—I have got land in two places which is irrigated, and the other land is *jarayat*.

4. Q. Are your lands irrigated by wells or tanks?—By wells.

5. Q. Did you lose your crops in the last famine?—Yes, in the *jarayat* land the wells dried up.

6. Q. Was there much loss of life in your village?—Yes, and of cattle also.

7. Q. You have only two wells?—Yes.

8. Q. Did you get any benefit from them?—I was able to produce vegetables.

9. Q. How much did you irrigate from these wells?—One acre and sixteen *guntas*.

10. Q. Could you not do more than that?—Under one well I have only that much land.

11. Q. And under the other well?—I have planted fruit trees.

12. Q. Have you any intention of extending the number of your wells?—They would be useful in *gorat* land, but not in black soil.

13. Q. You have no black soil?—My land under the two wells is *gorat*.

14. Q. Have you any other *gorat* land?—No.

15. Q. What would you suggest should be done to prepare the country to resist another famine?—We should have tanks in the black soil, and there should be sufficient water in them to enable rice crops to flourish.

16. Q. Have you any sites in the village where you can dig tanks?—There are tanks, but they are silted up.

17. Q. If they had not been silted up during the last famine, would you have got any water in them?—There was no rain and so there could be no water.

18. Q. They did not do much good?—No.

19. Q. Do you think it is any use sinking wells in black cotton soil?—No, of no use.

20. Q. Cannot *juari* be raised on black soil?—If there is rain *juari* prospers on black soil.

21. Q. If there is no rain cannot *juari* be irrigated from wells?—If there is a small rainfall then it cannot be irrigated from wells, because the wells are not full in October if there has been little rain. In black soil a good deal of water is required, and there are very few wells which could give a sufficient quantity of water to irrigate it.

22. Q. (*Mr. Higham*).—Did you lose any cattle in the famine?—Very few, I let the land to others and did not own the cattle myself.

23. Q. You do not cultivate your land yourself, you let it out?—Yes.

24. Q. (*Mr. Ibbetson*).—When did you construct your wells; in what year?—One well was made by my ancestors, the other well was sunk about ten years ago by a tenant to whom the land was let on a lease of 40 years.

25. Q. Was that before the settlement survey or after?—After the survey.

26. Q. No assessment has been paid as yet on account of the wells?—No.

27. Q. What assessment do you expect in the next revision of settlement?—To the best of my belief no assessment will be charged for the wells built by me.

28. Q. (*Mr. Rajratna Mdlr.*)—Are you aware that your land will not be liable to enhanced assessment in the general revision?—Yes, but the cultivators are afraid that the assessment may perhaps be raised on those fields in which there are wells.

29. Q. As regards *takavi* from Government, do you think that the present terms are very liberal—the rate of interest 5 per cent. and the period of re-payment 20 years?—Yes, they are liberal. When a well is sunk and the man gets good water then he should be charged, and Government should take the whole amount back from him, but should the water be brackish then Government should forego the amount.

30. Q. Would you recommend any further concession?—If Government charge water-rate then the people should be given some concession in interest.

31. Q. Only if they are charged water-rate and not otherwise?—If the water found is brackish, then the whole amount should be remitted.

32. Q. Would you recommend any extension of period beyond 20 years?—I think that is not necessary; the money might be lost.

33. Q. Do you recommend a reduction of the rate of interest from 5 per cent.?—I do not think it is fair to charge interest as Government derive benefit.

34. Q. What benefit?—They levy a water-rate.

35. Q. If they do not levy a water-rate at all?—Then 5 per cent. is quite fair.

36. Q. Do you mean that a water-rate will be charged at the next revision of settlement or a special water-rate when the wells are built?—If, at the time of revision, the assessment is to be raised then the cultivators ought not to

be charged interest; but if the assessment is not raised then interest might be levied at 5 per cent.

37. Q. You say that the terms, as they are at present, are liberal enough, then why do not the rayats take advances of takavi and extend their well irrigation?—At present they have got no manure and no cattle, and their means are not such that they can irrigate lands from wells; so what is the use of taking takavi.

38. Q. You say that under one well you have an acre and a quarter, and that you have no further area to irrigate;

would the neighbouring rayats take water from your well and pay you for it?—I would charge from Rs. 2 to Rs. 2-8 per acre for the water.

39. Q. (Mr. Muir-Mackenzie).—If you were to borrow money for a well, what rate of interest would you have to pay to the *bania*?—From 6 to 9 per cent. per annum.

40. Q. Have you heard of people getting money from the *bania* at from 3 to 4 per cent.?—No.

WITNESS No. 27.—MR. K. K. DESAI, Assistant Engineer, Broach.

Answers to printed questions.

No. 3.—Vāgra and A'mod Tālukas and a greater portion of the Broach Tāluka possess black soil. In Jambusar Tāluka we mostly meet with yellow soil. The black soil of the district is considered rich cotton soil and the general opinion is that it is unsuitable for irrigation. Cotton, rabi, juvār, wheat, etc., require but little rain and heavy rainfall would spoil the crops. Black soil being very retentive, it is probable that roots of plants would rot and, so long as people stick to the kind of crop now shown, no irrigation scheme can be worked successfully. Area under well-irrigation in black soil is certainly very small. Even vegetables are not sown to any great extent by well-irrigation in black soil. These facts tend to show that black soil is unsuited for irrigation and that is the general opinion. Irrigation is, however, practised on a small scale from village tanks even in black soil. They generally grow rice, and this fact makes one think a little before accepting the general conclusion mentioned above. It is probable that with manure and plenty of water the soil undergoes a change and adapts itself to irrigation. In the fifth mile of the Broach-Jambusar Road one can see a small patch of garden land in black soil, where mango and jambul flourish equally well. The depth of water in wells and in many instances salts dissolved in water seem to come in the way of well-irrigation, and I do not think that the defect lies in the soil. If good sweet river water can be obtained for irrigation, I think it can be utilized even in black soil with profit. Small tanks constructed in this soil hold water very well, and high earthen dams can be made of it without a masonry core, provided the surface is protected by a thick coat of yellow soil. Black soil in drying up contracts and cracks, and the dam is likely to be injured if the surface is not protected. At present irrigation is practised on a very small scale from village tanks, and there is always a demand of water for irrigated crops as the rainfall is insufficient. In case of prolonged droughts the village tanks, which are only useful at full supply level, dry up and cannot therefore supply the demand. In such cases water has to be drawn from wells where feasible. On account of this uncertainty of the supply of water some people (as at Kolavna) choose to grow cotton although they pay the full assessment and the water-rate, and as these are fixed on the area irrespective of the crops grown, revenue does not suffer. The owners of black soil did not much care for irrigation and on the contrary they preferred to have their areas properly drained off so that they might be enabled to grow cotton; but the recent bad years and consequent failure of crops have shown to them the necessity of having an unfailing supply of water. The only irrigation works in the district are a few village

tanks which fail exactly when they are most wanted, while assessment with water rate on such areas is very high, and it is no wonder that the people should be averse to irrigation; but, when an unfailing supply has been given, I think that people would take to growing irrigated crops. The district is flat and so far attempts have failed to obtain a tank which can have even five feet head of water. The only course is to obtain water from the Nerbudda, and so long as people do not change the kind of crop the channel cannot work with profit, for in ordinary years no water would be required by the land-owners. It would, therefore, be necessary to start a small scheme and let the land-owners see that it would be profitable to take to irrigation, and then the large scheme now before the Commission may be taken up with advantage. The land-owners have to undergo a large initial expenditure in the form of making bunds all round and manure, and they cannot afford to do it unless they are certain of the unfailing nature of the supply. One-half of the number of cultivators and labourers of the district cannot get work for seven months in ordinary years, and the result was evident in the last famine. It is therefore necessary to have irrigation in the district which would give work throughout the year to a good portion of them. As the large scheme cannot succeed all at once, I propose to pump up about 100 cubic feet per second of water from the Narbadda between Janore and Nand. This will be taken to a reservoir constructed so as to insure three days' supply. Main channel will be taken out from the reservoir. This would irrigate about 20,000 acres of land in years of average rainfall. It is true that the pumping arrangement is always dear, but the loss in the present case would be very small. Even if people do not take water, pumps can be utilized for other purposes, such as water-supply for towns and if the scheme succeeds, the larger scheme can then be taken up.

No. 8.—No more drainage works are required in the Broach District. All those that were required have already been done. Water-logged areas have improved and can now grow cotton. On the other hand, the villagers in the *bara* lands of Vāgra complain that channels have washed away the lands too much and have impoverished the soil. The Māmlatdār of Vāgra also informed me that wheat did not grow well in portions of *bara* lands adjoining the channels where it formerly flourished, as the layer of sweet soil having been partially washed away salt appears on the surface and this has spoiled the lands. He considered that it would be the best to let the channels gradually silt up to some extent.

Mr. D. D.
Sambhuram.
9 Dec. 01.

Mr. K. K.
Desai.
9 Dec. 01.

1. Q. (The President).—You are Assistant Engineer at Broach?—Yes.

2. Q. How long have you been there?—About three years.

3. Q. Where were you before that?—At Thana.

4. Q. You have been at Broach throughout the whole of this famine?—Yes.

5. Q. Were you in charge of the famine works?—Yes.

6. Q. (Mr. Muir-Mackenzie).—Are you a Gujarati?—Yes.

7. Q. The (President).—You say in your memorandum "at present irrigation is practised on a very small scale from village tanks, and there is always a demand for irrigated crops as the rainfall is insufficient." You are alluding to the last year or two, I suppose, when there has been no rain, or do you mean all years?—At present we have only a few tanks, and it is to these tanks that I refer.

8. Q. Do you mean to say that there is a demand for water, whether there is good rainfall or not?—If there is no rainfall, there will be no water in the tanks.

9. Q. Is there always a demand for water when there is a good rainfall?—Yes, they use the water even in good years.

10. Q. Do you consider rice a more profitable crop than cotton?—When they grow rice they generally grow two crops, and therefore the rice crop is most profitable.

11. Q. What do you grow after rice?—Gram.

12. Q. (Mr. Muir-Mackenzie).—And val?—Yes.

13. Q. (The President).—Have you had anything to do with repairing village tanks in your district?—Yes, I have repaired a few.

14. Q. Are they in good order?—They are generally silted up to some extent.

15. Q. What did you do to them as famine relief works?—Dug out the silt and enlarged them.

Mr. K. K.
Desai.

9 Dec. 01.

16. Q. By making new *bunds*?—No, by extra digging.
17. Q. Deepening?—Yes.
18. Q. At present are there many tanks that you know of in good condition and repair that will hold water, or are there only a few?—Most of them are for domestic purposes.
19. Q. I am talking of irrigation tanks?—There are very few in good order; in fact there are very few tanks at all. There are hardly ten.
20. Q. Hardly ten?—Yes.
21. Q. (Mr. Muir-Mackenzie)—Are there not some on the Ankleshwar side?—I am referring to the north of Broach.
22. Q. (The President.)—You do not think that you can find sites for more tanks?—We have been trying, but we have not succeeded.
23. Q. You say "One-half of the cultivators and labourers of the district cannot get work for seven months in ordinary years." That is very surprising. Do they live for twelve months upon the earnings of five months?—Yes.
24. Q. They do not work?—There is no work for them.
25. Q. The country is cultivated?—Yes.
26. Q. And there is no work for them?—No.
27. Q. You go on to say "It is therefore necessary to have irrigation in the district which would give work throughout the year to a good portion of them." Where is irrigation to come from?—I believe there is a project for bringing a canal from the Nerbudda which has been submitted by Mr. Beale.
28. Q. Is the country black cotton soil?—Mostly black cotton soil.
29. Q. You say "These facts tend to show that black soil is unsuited for irrigation and that is the general opinion."—We have small tanks where irrigation is practised; they actually grow rice. Although this is generally known as black cotton soil and unsuited for irrigation, this little fact shows that it is suitable for irrigation with good water.
30. Q. By building these tanks would there be an extension of rice cultivation?—Yes, and *bagayat*, fruit trees and garden produce.
31. Q. You say "A large scheme cannot succeed all at once. I propose to pump up water from the Nerbudda." Have you worked out the expenses of that?—I tried to get figures, but I could not get them.
32. Q. What is the height of the lift from the Nerbudda?—About 60 feet. To start with, we shall have to begin on a smaller scale than what I have proposed here.
33. Q. Can you lift about 100 cubic feet per second?—If it succeeds we can increase the volume.
34. Q. You want a very powerful pump?—Yes, or a number of them.
35. Q. Have you submitted this proposal to Government?—This is the first time I have mentioned it. I think pumping would be dearer than bringing the canal up, but people would not take to irrigation all at once, and with pumping we could extend gradually.
36. Q. Have you ever visited the agricultural farm here?—No.
37. Q. What is the feeling about water on black cotton soil. Does water do no good?—At first three inches of rain is required in black soil; after that the amount of water required would be about one inch.
38. Q. Have you got a programme of works for the next famine?—Yes, it is with the Executive Engineer.
39. Q. What do you think is the best work for famine labour?—Digging.
40. Q. What sort of digging?—We have tanks for Broach, and we have already got two reclamation projects. We have taken up these two projects, and if they succeed then more reclamation works will be undertaken.

41. Q. (Mr. Higham.)—How do you propose to get the supply of water?—It is proposed to get it by a canal from the Nerbudda.

42. Q. That is the only way?—Yes.

43. Q. There is no other way?—I propose to start in a temporary way by pumping up a small volume of water so that the people may learn to appreciate it. Although there will be some loss to Government, yet on the whole the project will be successful.

44. Q. You think it is possible that it may be economically advantageous to convert all cotton soil into wet cultivation?—Not all; about one-fifth of the whole area may be irrigated.

45. Q. Can you get water for it from the Nerbudda?—Yes; I wish to change the feeling of the people; at present there is a strong feeling that black soil is unsuitable for irrigation.

46. Q. Why do you wish to change the feeling?—Because there are small tanks where irrigation is practised successfully.

47. Q. Does not a tank put more water on the soil than rainfall?—Yes, they use tank water in addition to rain-water.

48. Q. (The President.)—Have you any cases outside tank irrigation to show that it would be profitable to apply water to black cotton soil?—In Poona, I think, they have black soil like that of Broach, and they use water there with advantage.

49. Q. I suppose the difficulty in making a tank in Broach is due to the fact that there is no fall in the country?—Yes; it is all flat.

50. Q. If there was some fall, it would pay to make tanks?—Yes.

51. Q. And as you cannot make tanks you propose to make canals?—Yes.

52. Q. Is there any other source besides the Nerbudda for getting water?—There is no other source that I know of.

53. Q. No springs?—No.

54. Q. If you were to bring water from the Nerbudda into the Broach District, would it not have the effect of water-logging a great area?—There would be no water-logging, because it would only take place where there are hollows, but then we have drains, so that there can be no water-logging.

55. Q. If you brought more water by canal, would it not necessitate making more drains?—No; at present they are considered too large.

56. Q. There are complaints that the drains take the water away too quickly?—Yes.

57. Q. Do they dry up the land too quickly?—Water-logged areas have certainly profited; it is the other lands which have suffered.

58. Q. The complaint is that the soil near the surface gets washed off?—That is in regard to the land lower down.

59. Q. Could not that be stopped by a *bund*?—That would be very costly; land owners cannot afford that.

60. Why would it be costly to make *bunds*?—If sluices were provided at each opening it would do. If there were *bunds* on both sides of the channels and if small gates were made at intervals I think that would do.

61. Q. Have you seen places where the soil is washed off?—I have; my experience goes back three years.

62. Q. Have you inquired into complaints on the spot?—I have been to Aladar, where one of the channels was opened out and the people there complained.

63. Q. What happened there?—On the surface there was no difference that I could see.

64. Q. Was the soil on the surface washed off?—The disappearance cannot be judged by the eye on the spot; it can only be arrived at from what the land can grow afterwards.

WITNESS No. 28.—MR. KHANDUBHAI KHUSHALBHAI, Patel and Land-owner, Olpad Taluka.

Answers to printed questions.

Mr.
Khandubhai
Khushal-
bhai.

I am now 52 years and have been all my life a cultivator.

A.—General.

3. (2) Insufficient.
(3) Insufficient.

- (4) Not suitable to black soil. Suited for gorat.
(5) No.
(6) Have got no sufficient funds.
(7) No.

9 Dec. 01.

6. Does not pertain to this taluka. Apparently people are willing now.

D.—Tanks.

23. (1) Natural flow.
- (2) Lift and supdas and natural flow. Villagers whose lands are irrigated engage two men who are paid in kind at the harvesting of rice.
3. (a) Up to March.
- (b) November.
- (c) None.
25. (1) Rice seedlings will be too mature to be transplanted.
- (2) Rice will fail.
29. From Rs. 25 to Rs. 30 per month. By the tenant.
33. Silt is formed about half a foot every year.

E.—Wells.

34. (1) 30 to 40 feet.
- (2) (a) No. By spring and percolation.
- (b) Yes.
- (3) With trough from Rs. 700 to Rs. 1,000.
- (4) 100 years and upwards if sweet. If brackish it lasts for 25 years.
- (5) By koss.
- (6) 1 to 3 acres.
- (7) Depends on the nature of the crop, about 5 acres per annum.
37. Paid on actually irrigated areas.
38. (1) No.
- (2) No.
39. No.

Mr. Khan-dubhai Khushabhai.

9 Dec. 01.

1. Q. (*The President.*)—You are a Patel and land-owner?—Yes.

2. Q. (*Mr. Ibbetson.*)—Of what district?—Surat district and Olpad taluka.

3. Q. (*The President.*)—How much land do you own?—About 200 acres.

4. Q. Is it irrigated?—Yes. I have a well.

5. Q. How many wells?—One.

6. Q. One well for 200 acres?—Yes.

7. Q. That is not much irrigation; how do you cultivate rice on your land?—I irrigate the land in which the well is situated. I do not irrigate the rest of the land; it depends upon rainfall.

8. Q. Did your village suffer much in the famine?—Yes.

9. Q. What do you think is the first thing to do for your village to enable it to resist famine should it occur again?—Tanks should be extended as wells are not successful there, when we dig a well deep brackish water comes up.

10. Q. Have you got tanks in your village?—Yes.

11. Q. How many?—There are about 25 tanks in my village; they are all small tanks.

12. Q. (*Mr. Rajaratna Mdlr.*)—Are they all irrigation tanks?—No, only two are irrigation tanks. The others are Local Fund tanks irrigating *kiari* lands.

13. Q. (*Mr. Muir-Mackenzie.*)—All of them?—Yes.

14. Q. (*The President.*)—Why do you say they are not irrigation tanks?—Tanks which irrigate more than 20 acres are called irrigation tanks; those which irrigate less than 20 acres are not called irrigation tanks. They call those tanks "irrigation tanks" which are repaired by the Public Works Department.

15. Q. Are these tanks in good order?—They are not.

16. Q. What is the matter with them?—They do not hold water.

17. Q. Do you do anything to improve your tank—dig it so that it can hold more water?—We are not able to improve our tanks as we have no money; we depend upon Government to do it.

18. Q. How much do these 25 tanks irrigate altogether?—About 200 acres of rice land.

19. Q. That is 200 acres of your own land?—No, I am talking of the whole village.

20. Q. What is the area of the whole village?—About 4,000 acres.

21. Q. Of these 200 are irrigated?—Yes.

22. Q. Do you think the tanks can be enlarged?—Yes; but other sites are available.

23. Q. You say in the memorandum that silt forms to the extent of about half a foot every year?—Yes.

24. Q. Who measures it?—It is simply guess work.

25. Q. How long ago were these tanks cleared; when was silt taken out of them last?—Only two tanks were repaired.

26. Q. How long ago; how many years ago?—I do not remember.

27. Q. Had they 10 feet of silt?—They were silted up altogether.

28. Q. (*Mr. Higham.*)—Do they want any more drains in the Olpad taluka?—Yes, we want drains.

29. Q. Have you anything to say about the damage done by the drains already made?—Water has been taken out of some water-logged areas.

30. Q. Why do you want drains; is the land much water-logged?—A certain portion is badly water-logged.

31. Q. Do you grow cotton on your land?—No, all the land is water-logged and no cotton can be produced.

32. Q. (*Mr. Ibbetson.*)—Is the whole village water-logged?—About 1,000 acres is.

33. Q. (*The President.*)—Inside the village?—Yes.

34. Q. No cotton can be grown in that area?—No.

35. Q. (*Mr. Muir-Mackenzie.*)—How many acres are there in the whole village?—About 4,000 acres.

36. Q. The culturable area is 2,950?—Yes.

37. Q. (*The President.*)—Have you heard complaints about the drains?—I have never heard any complaints.

38. Q. We have been told that good soil is washed into the drains?—I do not know; that is not my experience.

39. Q. (*Mr. Ibbetson.*)—How many of the 25 tanks were used during the famine year?—They were not used at all; they were not deep and so were all silted up.

40. Q. Did you dig *kachcha* wells in the beds of tanks?—*Kachcha* wells would not supply water to rice lands; the land is very sandy.

41. Q. Would you like the Government to make more tanks there?—If the Government made tanks on the water-logged areas they would be of great use. If these water-logged areas were converted into tanks, they would be very useful.

42. Q. Are there any sites available outside the water-logged areas?—There are no other sites available.

43. Q. Have you paid any extra assessment on account of your wells?—No.

44. Q. Do you think it likely that you will have to pay any extra assessment on their account?—No.

45. Q. Why do you not fear that there will be an extra assessment?—Because it will not be increased for thirty years.

46. Q. After that?—It might be.

47. Q. Do you know whether you will have to pay an extra assessment after thirty years?—It depends upon the revision of settlement; if Government raises it, then it will have to be paid.

48. Q. Are there many wells in your village?—No. It is very difficult to sink a well in our village which is near the sea; the soil is undulating and sandy and wells are not practicable.

49. Q. (*Mr. Rajaratna Mdlr.*)—You have only one well in the village for irrigation?—Yes. It is impossible to sink wells as the land is undulating and sandy.

50. Q. Do you think they would dig wells if they got *takavi* on favourable terms?—It is not possible to dig wells even if Government advanced the money.

51. Q. Out of 25 tanks, how many are there which irrigate less than five acres?—There may be about five or ten such tanks.

52. Q. Would the rayat be willing to take over such tanks and keep them in repair if the water-rate is reduced by one-half?—People are not in a position to do that.

Mr.
Manibhai
Khandubhai.

9 Dec. 01.

53. Q. Would it not be profitable for them to do it?—They are not able to spend any capital on land.

54. Q. (Mr. Muir-Mackenzie.)—How much *kiari* land is there in your village?—More than 200 acres.

55. Q. There are 25 tanks for 200 acres of *kiaris*?—Yes.

56. Q. Do you think that it would be a good thing to make tanks in the water-logged soil?—Yes.

57. Q. Was any application made to Government about this?—No; but we have asked the local officers to make drains to remove the water.

58. Q. At what rate could money be borrowed from the *baniyas* of your village?—From 12 to 15 per cent.

59. Q. Can you yourself get money for less than that?—Not less than 6 per cent.

60. Q. There are no waste lands?—All the waste lands are salt.

61. Q. If a tank is made in salt lands, would it be useful?—No.

62. Q. What is the cost of a well?—The average cost of a well for one *kos* is not more than Rs. 1,000.

WITNESS No. 29.—MR. MANIBHAI KHANDUBHAI, Patel, Ambeti Taluka.

Mr.
Manibhai.

9 Dec. 01.

1. Q. (The President.) (Through an interpreter.)—You are a Patel?—Yes, of Ambeti taluka in the Surat district.

2. Q. Are you a land-holder?—Yes.

3. Q. How many acres do you own?—About 50 acres.

4. Q. Did you suffer much from famine in your village?—Only the *juari* died; the other crops were successful.

5. Q. Was there any loss of life?—No.

6. Q. How are the crops grown: have you any irrigation there?—We have wells in the village.

7. Q. How many wells?—About 70.

8. Q. What is the area of your village?—About 1,800 acres.

9. Q. How much of the village is irrigated?—About 100 acres, *bagayat*.

10. Q. Then, you have 70 wells to 100 acres?—Yes. Only *gorat* lands and *jarayat* lands are irrigated: dry-crop lands are not irrigated.

11. Q. During the famine year how much land was irrigated?—About 100 acres.

12. Q. You did not irrigate more?—There was rice on the rice lands.

13. Q. How did that rice fare?—It all dried up, but some *kiari* lands were irrigated, and the rice crop on them was successful. They got about a 4-anna crop.

14. Q. (Mr. Ibbetson.)—They were irrigated from wells?—Yes.

15. Q. (The President.)—All the rice failed?—Yes, but in some *kiari* lands well water was used and so some rice was raised—a 4-anna crop.

16. Q. Why did they not irrigate more?—The sugar-cane had to be considered. After a rice crop, sugar-cane cannot be raised for two years.

17. Q. (Mr. Rajaratna Mdlr.)—Was no water available for fodder crops?—All the sugar-cane is under wells, and the wells could not be utilized for that crop.

18. Q. A well can only irrigate an acre and a half?—Yes, of sugar-cane, but three acres of dry crop land can be irrigated.

19. Q. They did not irrigate other crops?—All the land was occupied by sugar-cane, and so there was no land for dry crops. The water was entirely utilized in irrigating sugar-cane.

20. Q. If there was water enough in times of famine, would they not utilize the water to raise fodder crops in addition to sugar-cane?—They had enough of fodder in the taluka, and so they did not raise it.

21. Q. (Mr. Ibbetson.)—Do you think that fear of enhanced assessment prevented people from making more wells?—Yes.

22. Q. What makes you think so?—The cultivators are afraid of increased charges.

23. Q. On account of the wells?—Yes.

24. Q. Have you many tanks in your village?—Four tanks, large and small.

25. Q. How much land is irrigated from them?—About 50 acres.

26. Q. Are they in good repair?—No, they are not.

27. Q. If they were put into good repair, how much land would they irrigate?—About 100 acres.

28. Q. Double the present area?—Yes.

29. Q. Would the people like to see them put into repair?—Yes.

30. Q. Supposing that, for the extra 100 per cent., the people had to pay the wet assessment, would they still like to see them repaired?—Yes, if water was available, the people would pay for it.

31. Q. You say that the people would object to the plan by which Government should make wells, and then charge wet assessment on the land; why should they object?—The people are already assessed a sub-soil rate, and if they are charged an additional rate of Rs. 12 per *kos* it would be very hard on them.

32. Q. Do you think Government can make wells as cheaply as the people themselves?—If wells are wanted, the people can make them themselves: they did it in famine times.

33. Q. (Mr. Rajaratna Mdlr.)—The 70 wells you referred to, are they irrigation wells?—Yes, there is also an irrigation tank, but this year there is no water in it.

34. Q. Are many of them old wells?—About 30 or 40 are new wells.

35. Q. When were these 40 old wells constructed?—Before the original Survey—about 50 or 60 years ago.

36. Q. What was the assessment at the original survey on these wells?—An average of Rs. 5 per acre, *bagayat*.

37. Q. What was the assessment under the revision of settlement?—Rs. 15 and Rs. 5 per acre on *kharij* lands.

38. Q. From an average of Rs. 5 to an average of Rs. 15?—At present the rates are Rs. 15 to Rs. 16 per acre under tanks, and for land under wells Rs. 4 to Rs. 5 per acre.

39. Q. I am not referring to tanks?—Wells are Rs. 4 to Rs. 5. At the time of the original survey, the assessment was Rs. 5 to Rs. 6 per acre, and at the revision survey, they were from Rs. 4 to Rs. 5.

40. Q. So there has been a reduction?—The total assessment on the whole village remains the same as at the original survey; there was some reduction in some fields and increase in others.

41. Q. (Mr. Muir-Mackenzie.)—Were any new wells made in the famine year of 1899?—Four new wells were constructed.

42. Q. Are they all being used now?—Yes, they are all being used.

43. Q. Where did the money come from?—The people spent it out of their own pockets.

44. Q. How much did they cost them?—Total cost of each was from Rs. 200 to Rs. 300.

45. Q. Were they *pakka* or *kachcha*?—*Pakka*.

46. Q. Of how many *kos*?—Of one *kos* each.

WITNESS No. 30.—MR. SULEMANJI CASSUMJI, Patel of Kuranja, Mandvi Taluka.

Answers to printed questions.

Mr. S. 1. I am now 50 years and have been all my life a culti-
Cassumji. vator.

A.—General.

9 Dec. 01. 3. (1) Yes.

(2) Insufficient.
(3) Insufficient.
(4) Yes, suitable.
(5) Yes.

Mr. S.
Cussumjee
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(6) There are about eight, or ten villages in the whole taluka in which from two to four men are capable of taking the advantage.

(7) Yes.

4. None.

5. No.

6. No.

D.—Tanks.

23. (1) No natural flow.

(2) By cutting canals and by supdas.

(3) (a) April, May.

(b) November end.

(c) None.

26. Yes, to save the crop when water fails.

30. For tanks irrigating more than 20 acres Government contribute 90 per cent. while the villagers pay 10 per cent. Very few tanks are repaired in this manner.

E.—Wells.

34. (1) 45 to 60 feet.

(2) By spring and percolation. All wells which have dried up were supplied by percolation.

No, but owing to successive seasons of short rainfall they have become saline now.

(3) Rs. 700 to Rs. 800.

(4) About 100 years.

(5) By *kos*.

(6) One to 3 acres.

(7) One to 5 acres per annum.

38. No. Where the stone blasting when chopda is found, it is necessary to build.

39. No.

40. No. It will go a great way to assist the cultivators to construct *kachcha* wells.

Remarks.

1. The character of the soil is *gorat*, black and besar. There is no demand for water. The crop which requires irrigation is rice. It requires watering three or four times during the season about the middle of July, and thereafter if there be no rain up to October.

2. Black soil also requires water in *kiari* lands grown with rice. Small tanks constructed in such soil hold water. If the tank is dug till the *goramti* soil is found. Say if 4 to 6 feet are dug. High earthen dams can be made of it without masonry core walls. During average rainfall black soil will require water. There has been a desire for irrigation works on the part of owners of black soil and the construction of tanks is remunerative.

3. No money should be spent from the District Board's funds on canal irrigation. It is not the practice for Government to encourage the construction of such works by loans to District Boards. Local responsibilities should not be enforced in this connection. Such works are of great value as concerning village water-supplies for men and cattle.

4. The construction of new wells be encouraged. No experiments have been tried to deepen wells as none ran dry.

Artesian wells should be encouraged.

1. Q. (*The President*).—(*Through an interpreter*).—You are a Patel?—Yes.

2. Q. And also a land owner?—Yes.

3. Q. How much land do you own?—Eighty acres in British territory.

4. Q. Have you any irrigation works in your village?—New wells were sunk during the famine year from *takavi* advances.

5. Q. What is the area of your village?—About 2,400 acres.

6. Q. How many new wells were made?—Six.

7. Q. Were there any wells before that?—They were drinking wells, not irrigation wells; the latter are also useful for drinking purposes.

8. Q. Have you any tanks?—Yes, six, of which three are irrigation tanks.

9. Q. What area of crop is raised under these?—About 70 acres of rice.

10. Q. In a village of 2,400 acres, that gives a very small area of irrigation?—Only some rice lands are irrigated; nothing else.

11. Q. Do you think the village would be best improved by making more wells or more tanks?—More tanks; wells are not practicable in the village.

12. Q. Why are they not practicable?—Water does not come strongly enough from the springs.

13. Q. Are the wells very deep?—You cannot go down deeper than thirty or forty *hath*.

14. Q. (*Mr. Muir-Mackenzie*).—Is there rock?—No we meet a treacherous quick sand.

15. Q. (*Mr. Ibbetson*).—Is it *chopda* land?—Yes; we cannot go deep, because of the quick sand.

16. Q. Did your village suffer very much during the last famine?—Yes, very much.

17. Q. Do you know of any sites suitable for making more tanks in the village?—Yes; there are sites available in the village.

18. Q. Would you like to see the system of tanks extended?—Yes.

19. Q. In your reply to the written questions you say that the people are prevented from digging wells by the fear of enhanced assessment; why did you say that?—I did not say so.

20. Q. Is there any likelihood of enhanced assessment being put on your land on account of new wells?—I am not afraid of that being done.

21. Q. Why do you think that the well lands will not be assessed?—No wells are practicable and there is no *bagayet*; therefore, there should be no assessment.

22. Q. You have made six new wells?—Yes.

23. Q. How do you know that there will be no enhancement of assessment?—Government may increase the assessment on new wells.

24. Q. As a matter of fact have Government made any promise not to do so?—I am not aware of any promise.

25. Q. Are the tanks in your taluka in good repair?—Two of them are in good repair.

26. Q. The others?—They have to be repaired.

27. Q. When were these two tanks repaired?—In 1899, during the famine.

28. Q. If the other tanks are repaired, would the cultivators irrigate more land?—If they are all repaired, more land would be irrigated. It would be advantageous.

29. Q. Would the people be ready to pay extra assessment on that land?—Yes, they would be willing to do so.

30. Q. You say that you do not approve of Government making wells in private lands and charging on the land; why do you say that?—If Government make these wells and charge on the land, then the neighbours will take advantage of the wells without being charged any rate.

31. Q. Supposing, instead of advancing *takavi*, Government made wells, and instead of recovering the cost from the cultivators, charged wet assessment, would they like that arrangement, or would they prefer to take *takavi*?—They would prefer to sink a well at their own cost.

32. Q. (*Mr. Muir-Mackenzie*).—Why would they prefer that?—They would not like to incur a debt; and so would rather do it at their own cost.

33. Q. They would not take *takavi* under these conditions?—No.

34. Q. Supposing Government paid for the wells and charged assessment, there would be no debt?—They would like it, if Government did not take the money back.

35. Q. Supposing Government took no money back and charged assessment?—They would like that.

36. Q. How much assessment would you be willing to pay?—Not more than *lis. 6* per *kos*.

37. Q. How many acres would a *kos* irrigate?—Three acres.

Mr. Syed
Gulam
Husein.

WITNESS NO. 31—MR. SAYAD GULAM HUSEIN GULAM MOHIDDIN.

Answers to printed questions.

Dec. 01.

1. The area of Ankleshwar Taluka is 85,747 acres and 32 gunthas.
2. The culturable land is 76,952 acres and 8 gunthas.
3. In the following years land below mentioned was irrigated:—

Year.	Acre.	Gunthas.	
1898-99	. . 67		Tank water.
"	. . 302	242	Well water.
1899-1900	. . 636	32	"
1900-1901	. . 1	11	Tank water.
"	. . 154	29	Well water.

4. There are three kinds of land in Ankleshwar Taluka ;

1. Black soil.

2. Yellow soil.

3. Black and yellow mixed called Besar (Gabhania).

5. Gain from cultivation much depends on irrigation. When the rain is scanty the cultivation entirely depends on irrigation. If the rain is sufficient throughout the four months then only the culturable lands do not require addi-

tional water. Rice, sugarcane, wheat, tobacco, vegetables, etc., require much water.

In Gujarat there being no irrigation work people entirely depend on rain water.

6. In this part sufficient outturn from cultivation can be obtained if the rainfall is 30 to 40 inches.

7. If 4 or 5 inches of rain falls in the beginning of October or before the end of September there would remain no need for rain for the rabi crop.

8. If the rain is scanty wheat and Juari crops require to be watered. Sugarcane and other Bagayet crops always require water.

9-10. This answer requires to be dealt with at great length, but in short I state my opinion that every vegetable and Bagayet crop requires water 20 to 25 times, and that is to be given at least at the interval of eight days.

11. The water rate is merged into the assessment, and therefore no separate figures are given. Generally water rate is charged at Rs. 6 per Bhingha. This rate is recovered whether there be no crops raised in the field.

I shall state other information besides what is given above orally before the Commission.

1. Q. (*The President through an Interpreter.*)—You belong to Ankleshwar in the Broach district?—Yes.

2. You are a land-owner there?—I am an Inamdar.

3. Q. How much land do you own?—I own 3,500 *vinghas* including alienated and Government land.

4. Q. Has the village been surveyed?—No.

5. Q. Has the village been irrigated at all?—In one village, Amolce, there are two or three wells which irrigate.

6. Q. Is that all?—Yes.

7. Q. Are there any tanks?—No.

8. Q. Did your district suffer very much during the last famine?—Yes, it suffered a great deal, and large numbers of cattle died.

9. Q. Can you suggest anything practical to guard against the effects of another famine?—I would suggest the construction of more canals and tanks. The people would take advantage of them.

10. Q. Cannot wells be made?—Wells are not profitable; to irrigate an area with well water costs a good deal.

11. Q. How much does it cost?—To irrigate one *vingha* of land it costs Rs. 1-8 per day.

12. Q. How much does a well cost?—A small well, Rs. 500, and a large one, Rs. 700.

13. Q. Government will give you help for that. Would you take takavi?—Yes, but I cannot get it.

14. Q. Why not. Did you ask for it?—I asked, but I did not get it.

15. Q. Why did you not get it?—Government did not choose to give it.

16. Q. Do you prefer canals or tanks?—I prefer canals to tanks.

17. Q. Where would you get canals from?—From the Nerbudda and Tapti.

18. Q. What is the soil like?—*Gorat* and black soil, but mostly *gorat*. I refer to the whole taluka, and not to my own village. Canals would be beneficial to the whole taluka.

19. Q. Are there any places in your taluka where you can make tanks?—Yes, sites are available.

20. Q. Was any tank work done by famine labour during the last famine?—Not in my village: in the Ankleshwar taluka two tanks were repaired, but they have not proved useful.

21. Q. Why not dig wells in your own village?—It depends upon the wish of Government.

22. Q. Would you make a well if you get a takavi advance?—With great willingness.

23. Q. Would you make more than one well?—I do not favour wells; I prefer tanks.

24. Q. Could you get money from the *sowcar*?—There are no *sowcars*, and no *sowcar* would lend money in a famine year.

25. Q. (*Mr. Ibbetson.*)—What rate of interest would they charge?—From 9 to 12 per cent.

26. Q. You say you do not approve of wells, but that you would like to have tanks: why is that?—The people have to work on wells the whole day, and their whole time is occupied in irrigating half an acre.

27. Q. Can you grow rice in your village?—There are no rice lands.

28. Q. What would you irrigate from tanks?—Sugarcane, wheat, and indigo.

29. Q. (*Mr. Rajaratna Mdlr.*)—Are there good sites for tanks in your *Inam* village?—There are.

30. Q. Have you any idea of the probable cost of such a tank?—A good tank would cost Rs. 10,000 to Rs. 15,000.

31. Q. Would you be prepared to make such a tank yourself if Government gave you takavi?—I would accept the money, if Government would take it back in a large number of instalments.

32. Q. How many instalments?—I am not prepared to say.

33. Q. (*Mr. Muir-Mackenzie.*)—Do you advance money to any of your tenants?—No.

34. Q. Have you any water-logged lands in your village?—No.

35. Q. Have you seen any of these drains?—I have seen in Piludra and other villages.

36. Q. Did that do good or harm?—It has been advantageous to the neighbouring villages.

37. Q. If it is extended further on, would it be advantageous to other people also?—Yes.

38. Q. Have you heard that the surface soil is washed away?—Yes. If water goes slowly, then the surface soil is not washed away. If it goes rapidly, then the surface soil is washed away.

39. Q. (*Mr. Ibbetson.*)—Which water—the water in the drain, or water running on the surface?—The rain water falling on the surface.

40. Q. (*Mr. Muir-Mackenzie.*)—Where is your village, near the drain?—About a *kos* from the drain.

41. Q. Do any tenants get *bagayet* lands?—Yes.

42. Q. The village is not surveyed?—No.

43. Q. What rent do you take from the villagers?—I charge from Rs. 4 to Rs. 6 per acre.

44. Q. How much do you charge for dry crop land?—The same charge: I do not make any distinction.

45. Q. Do you take rent by instalments?—No. Government charges water assessment on the land, whether it is irrigated or not, but it should charge assessment only on the actually irrigated area. There are many creeks in Ankleshwar taluka and if dams were built we could use the water. In the rainy season these tracts are full of water, but the water flows uselessly away. If this flow could be checked and the water impounded, the cultivators would be benefited thereby.

46. Q. Is the water not salt?—No.

NINETEENTH DAY.

Surat, 10th December 1901.

WITNESS No. 32.—MR. J. MOLLISON, M.R.A.C., Inspector-General of Agriculture in India.

Letter from Witness to the Chief Secretary to Government, Revenue Department, Bombay, No. 21, dated the 16th November 1901.

Mr.
J. Mollison.
10 Dec. 01.

In reference to your No. 2282, dated the 26th October 1901, Famine Department, I have the honour to offer the following remarks on extension of irrigation throughout the Bombay Presidency.

2. During 11 years' work in the Presidency I have gained a fairly accurate knowledge of the agricultural conditions existing in each collectorate.

3. In the following Note I refer separately to agricultural conditions and facilities for successful irrigation as they exist in (A) Gujarat, (B) the Deccan and Southern Mahratha Country. I do not think it is necessary to include in the enquiry the Konkan, Kanara or the southern talukas of the Surat District. In these tracts the rainfall is generally so heavy and assured that rice is the staple crop. There has in these parts occasionally been partial crop failure from scant rainfall, but there is much more pressing need of extended irrigation in other parts of the Presidency.

4. In Gujarat the soils vary considerably in character. Some of the soils can be successfully irrigated, others cannot.

5. In considerable portions of Ahmadabad, the Panch Mahals, Kaira and in adjoining Baroda territory the soil is deep alluvium. It varies in character from a light sandy loam to a stiff loam. These alluvial soils extend to a depth of 40 feet or more often without any change in character or consistence. The older existing wells usually hold an unfailing supply of water. The water in some wells is sweet, in others brackish. Wells with sweet and brackish water are commonly found very close together. The water from brackish wells is specially suitable for tobacco, but it may not be so salt as to be unsuitable for other crops. The initial cost in determining whether a well is likely to yield sweet or brackish water is small.

6. In these alluvial plains there is considerable scope for extension of successful irrigation from wells. Such extension would require not only large initial outlay, but large recurrent expenditure, because the wells would be costly in construction and the permanent water level being low the cost of raising water would be high. It is certain, however, that the average cultivator in these parts before the last famine was tolerably well circumstanced. The Charotar villages of Kaira and of Baroda territory are probably as fertile as any in India and the average Kutchi cultivator in them has or can provide sufficient labour and manure to do full justice to any extended scheme of well irrigation. In the famine year (1899-1900) the cultivators of these Charotar villages, as also generally throughout the alluvial plains of Northern Gujarat, helped by small *takavi* advances from Government, set themselves to dig *kachcha* wells in large numbers. The cost of digging through the soft alluvial soil was trifling. A *takavi* advance of Rs. 25 or Rs. 30 was sufficient for digging a well and for the leather bag, rope and other fittings. The perpendicular sides of these *kachcha* wells were very solid, and it was exceptional to find a *kachcha* well falling in during the fair season. These wells were, of course, useless after the following monsoon. Many of them gave a full supply of water throughout the season. One year of the drought does not materially lessen the supply of water in good wells in this tract.

7. It is not possible to dig *kachcha* wells so successfully in black soil or mixed black soil tracts, because the wells, after use for a short period, have a tendency to fall in.

8. In the alluvial tract of Northern Gujarat there are a good many low-lying situations which are suitable for rice. The position is improved by artificial bunds round the rice beds, but the rainfall is usually insufficient for rice and without artificial means of irrigation for two or three waterings towards the end of the season the crop is precarious. Such irrigation is obtained to some extent from wells, also from tanks. Greater protection by tanks or wells is required particularly in the more extensive rice areas, as for instance in the Mehmabad Taluka of the Kaira District and in the western talukas of Ahmadabad.

9. In the wheat and cotton growing parts of Ahmadabad, also in parts of the Panch Mahals and Kaira, the soil is black or mixed black. It varies considerably in depth and character. The substrata also vary. Below the black soil may be found light-coloured argillaceous layers more or less concreted with lime and consequently more or less impervious to water. These combinations of soil and subsoil when impervious are not well suited for successful irrigation of the ordinary crops. In the black soil parts of Ahmadabad the rainfall is usually light. There are, however, a good many situations where rice beds assisted by tank irrigation have been successfully formed and there is probably considerable scope for extension and for further protection either by small tanks or wells.

10. In the Kaira and Ahmadabad Districts there are certain salt lands existing in some places in patches, in other places in more extended areas. Wells constructed in such areas have usually brackish or salt water useless for irrigation. After a year of drought in these salt land areas well water, which is usually slightly brackish, may become intensely so.

11. *Pakka*-built wells of ordinary depth and capacity generally throughout Northern Gujarat cost Rs. 1,000 to Rs. 1,500 each and large wells capable of working four lifts (*kos*) much more. The deep alluvium of Kaira and Ahmadabad, particularly if sandy in character, needs water very frequently and a single *kos* will not irrigate more than two acres. Gujarat wells are, however, usually capable of keeping two or more *kos* at regular work.

12. In the famine year (1899-1900), although the general area under irrigation in the Presidency declined, the well-irrigated area increased by about 100,000 acres. More than three-fourths of this increase occurred in Kaira and Ahmadabad, although the water of many of the old wells in the black soil parts and in salt land villages became too salt for irrigating crops. The rice areas were largely unsown and the tanks throughout these districts dried up. I can from personal knowledge say that the fodder produced from well-irrigated crops throughout Northern Gujarat in 1899-1900 was the means of keeping alive many of the cattle which survived the famine. The value of cultivation of this kind in producing food for men and beast, in providing useful home labour and in keeping people off relief works cannot be lightly discounted. I believe that a *pakka* well could, with advantage, be constructed in every position occupied by a *kachcha* well in the late famine and in thousands of other favourable positions throughout the alluvial tracts of Northern Gujarat. Such wells would be uncommonly useful in an ordinary season and in a year of drought or famine would provide water sufficient for very extensive irrigation.

13. In the famine year it was possible to irrigate from a two-*kos* well three crops on three different areas covering altogether 10 or 12 acres of ground. The three successive crops in Northern Gujarat were ordinarily Sundhia jowar sown in September, wheat sown in November-December and Sundhia or Chino (*Panicum miliaceum*) sown in March-April. The grain of Sundhia is of trivial value, but the fodder is very fine and nutritious and a fair average crop produces about 6,000 lbs. of dry fodder per acre. A good crop of irrigated wheat in Gujarat yields over 2,000 lbs. of grain and 2,500 to 3,000 lbs. of straw per acre, but owing to rust wheat is a risky crop in Gujarat. The hot weather crop of Sundhia does not on an average yield so heavily as the earlier crop. There was no dearth of manure in the famine year because it was not required for dry-crop cultivation. The whole supply of the year was available for well-irrigated patches and the crops produced were enormous.

14. Throughout Broach, excepting the alluvial belt along the Tapi and the sandy belt along the coast, the soil is deep black cotton soil. On such land rice beds have been successfully formed under village tanks and more could be formed. The soil is entirely unsuitable for the cultivation of other crops under well or canal irrigation because it is extremely deep and retentive of moisture and the substrata are impervious.

Mr.
J. Mollison.
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15. The soils in the northern cotton-growing talukas of the Surat Collectorate are more variable. There are the rich alluvial *bhata* soils which fringe the Tapti and extensively grow valuable garden crops under irrigation from shallow wells. Throughout the district there are a number of garden villages with considerable areas of alluvial soil somewhat similar to *bhata*. These grow a great variety of valuable garden crops under well irrigation. Generally, however, the soil in the northern talukas of Surat is deep and black and chiefly grows dry crops of cotton and jowar. In parts the soil is more mixed in character and in such places well irrigation is extending. I refer in particular to clay loam (*kali besar*) soils adjacent to the alluvial lands of garden villages. Such mixed black land has extensively been brought under well irrigation since Revision Survey. The reasons are that the land is suitable for irrigation, the occupants are men of means and now enjoy assurance of tenure at a fixed rent for a definite term of years. On this class of land there is scope for extension of irrigation—perhaps also in the Surat District on mixed black soil of heavier character, but there are certain risks in constructing wells on such heavier land which ought to be referred to. It is uncertain whether a well, when constructed, will yield sweet or brackish water. Water which is sweet early in the season may turn brackish during the hot weather. Brackish water for irrigation deteriorates temporarily or permanently mixed black soil and on any soil is only suitable for certain crops. In the black soils of the northern talukas of Surat, as in Broach, more tanks for rice irrigation could with advantage be constructed.

16. In paragraph 4 of the memorandum of points to be considered by the Irrigation Commission there is a question of utilizing the waters of the Nerbudda, Tapti and Sabarmati. The waters of the two former rivers could only in Gujarat be diverted to irrigate black soil areas which are to a very large extent quite unsuitable for irrigation. The waters of the Sabarmati or any other stream which flows through the alluvial plains of northern Gujarat would be extremely useful for irrigation, provided the lands irrigable consists of light or comparatively light alluvial soil, but if this proposed system of irrigation is carried through the low-lying black soil *rabi* areas of the western talukas of Ahmedabad, it is almost certain that the results would be unsatisfactory.

17. The information given in the foregoing paragraphs in reference to the various districts of Gujarat indicate that considerable extension of irrigation is practicable. There are, however, risks which must be kept well in view.

18. In parts of the Deccan and of the open plains of the Southern Mahratha Country the water in the wells got so low in 1899-1900 that irrigation was intermittent. This was not the result of one season of drought, but of several seasons of scant rainfall. The famine year 1896-97 caused extreme drought over the greater part of the Deccan, and the more open plains of the Karnatak, still in these parts, in that year, the wells held sufficient water for very extensive irrigation. There was then considerable activity in constructing new wells and in deepening old wells to increase the water-supply. Large portions of the Deccan and the Karnatak are extremely liable to seasons of drought, but it is difficult to believe that those parts will again have a succession of seasons so disastrous as those which began with the famine of 1896-97 and culminated with that of 1899-1900. During that period in places the water in the wells got so low that even drinking water became scarce. Still statistical figures show that excepting Poona and Sholapur there was in 1899-1900 a considerable increase of irrigation under wells in all districts of the Deccan and Karnatak as compared with the year before. In these districts the protection afforded by wells against drought is in my opinion much more satisfactory than that afforded by tanks or larger irrigation works. After years of scant rainfall the tank and canal supplies fail just when the water is most required and it can be put in evidence that some at least of these larger irrigation works are not an unmixed blessing in other respects. I can call to mind several enquiries which the Bombay Agricultural Department was asked to institute in recent years regarding damage done to land by tank and canal water in causing water-logging, salt efflorescence, etc. Considerable damage has been caused by Roh under the Nira Canal. The Manjri and Mundwa sugarcane area has been flooded to excess by the Kharakwada Canal for a number of years. A good deal of land which was formerly cultivated has by excessive water-logging been converted into swamp and owing to unhealthy conditions produced by wetness of soil. The crops of cane now grown are not nearly so good on an average as they were 5 to 10 years

ago. I can, if questioned by the Commission, give detailed reasons for these failures and for other failures of irrigation works throughout the Deccan and Karnatak.

19. There are various reasons why irrigation from wells cannot be indiscriminately extended. The cost of raising water from a depth of 25' or 30' as in the Deccan is heavy and is particularly so from the deep wells of Gujarat which range in depth from 40 to 60 feet. This cost is so great that only a good well-irrigated crop can pay. A good crop under ordinary circumstances can only be produced if heavily manured, carefully cultivated and regularly watered. This necessarily restricts the area which can be successfully irrigated from wells to such situations as have at reasonable depth tolerably certain supplies of sub-soil water in ordinary seasons. It also restricts the cultivation of well irrigated crops to cultivators in easy circumstances, to men who have the means or the credit to provide sufficient manual labour, sufficient manure and sufficient work cattle. Perhaps it would be possible for a few years to grow on the very rich alluvial soils of Gujarat successive unmanured crops which would pay, but such practice would cause soil exhaustion in a very short period in ordinary Indian soils. Valuable crops grown under wells must necessarily be watched by the owners. Therefore it is not likely that such cultivation will extend far from the village sites.

20. Irrigation from a tank or canal is cheaper than from a well, but with any system of irrigation heavy applications of manure and specially careful cultivation are necessarily required to give profitable results in average seasons. In years of absolute drought waterings as required would, however, without manure or special tillage be extremely beneficial on such land as is suitable for irrigation.

21. I have stated certain circumstances which will restrict the successful extension of any system of irrigation in the presidency. In my opinion the chief restriction to this or any other agricultural improvement will be found in the large and general indebtedness of the agricultural classes to the Banias. I see no hope of special agricultural advancement in the Bombay Presidency until this incubus of debt is removed. It practically paralyses every effort towards improvement. I would be prepared to recommend that Government should once for all liquidate the debt in some fair and reasonable way and make it impossible afterwards for the cultivator to borrow on the security of his land. Then it would be impossible for him to waste his substance in useless caste ceremonies to the extent that he does now. There is no doubt that the general outturn of crops in the Bombay Presidency is in ordinary years very seriously affected by the indebtedness of the cultivators because they are not in a position to cultivate to the best advantage.

22. Throughout the Presidency generally the oldest well may generally be said to occupy the best positions. This indicates on behalf of the people an intimate knowledge of the most favourable conditions for successful well irrigation. In the rolling uplands of the Deccan and Southern Mahratha Country (excluding the red laterite soils in the west of Belgaum and Dharwar), it may be definitely said that the most favourable positions for wells are the bottom lands consisting of mixed black soil 18" to 4' deep overlying murum with unchanged trap still lower down. These substrata are pervious to water and secure natural drainage—very important considerations when land is continuously irrigated. There are throughout the Deccan and Southern Mahratha Country very numerous situations where wells can still with great advantage be constructed. Fringing the most important rivers of the Deccan and Southern Mahratha Country, such as the Tapti in Khandesh, the Godavari in Ahmednagar, the Krishna in the Southern Mahratha Country the soil is deep black. It gets sodden and wet in the monsoon. It is extremely retentive of moisture. It is not pervious and therefore like the deep black soil of Broach is unsuitable for growing irrigated crops. Such lands are specially suitable for dry *rabi* crops.

23. The best wells in the Deccan and Southern Mahratha Country keep two or more motes (leather bag lifts) actively at work in ordinary years. A single mote will from a good well of moderate depth irrigate $3\frac{1}{2}$ to 4 acres of such crops as require light irrigation, e.g., wheat, onions, and 2 or $2\frac{1}{2}$ acres of such crops as require much water, e.g., sugarcane.

24. In the 1899-1900 famine year the area under well irrigation in the Presidency was considerably extended through *takavi* advances for constructions of *kachcha* wells and for deepening and repairing old wells. These advances were not so serviceable in the Deccan and Southern Mahratha Country as in Gujarat. Special officers were employed to deal with applications for *takavi*, but could not complete all

inquiries in the Deccan and Southern Mahratha Country soon enough to make the advances serviceable. It takes some time to sink a well through hard trap in the Deccan. In a famine year the water level is lower than usual and as the season advances gets lower day by day. *Rabi* irrigated crops can only be sown seasonably during a certain period. It is therefore practically useless in a famine year to give *takavi* for wells except for deepening after November-December.

25. It may be inferred from the last paragraph that I advocate the need of liberal *takavi* advances in ordinary years rather than in famine years for well construction. Preliminary enquiry which must take time is necessary before *takavi* can be given safely for wells. This enquiry can only properly be made by experienced practical men. A man with sufficient knowledge of all the circumstances connected with successful extension of well-irrigation would have no difficulty in disposing of numerous applications in a short time. He could take district by district, and to begin with sanction advances only to tolerably well-to-do cultivators and by preference select the more favourable positions. An experienced practical man with an intimate knowledge of native character if put on special duty would in a single season be able to dispose of many applications if he took up district by district in a systematic way and thoroughly exploited each. He would be handicapped in his work in an intolerable way if loans when sanctioned are not promptly paid in full. Such loans would be more freely taken by the people if the present 6 per cent. rate of interest was lowered. It is currently believed that the *takavi* system is unpopular because controlled to some extent by subordinate Government officials who for personal gain make a substantial deduction from each loan.

26. Complaints are made that successful applicants for *takavi* do not always spend the loans in the manner contemplated by Government. If it can be proved beyond question that loans given for well construction are generally misapplied, then I think Government should undertake the construction of wells in the same way as any other irrigation work. A cultivator can construct a well cheaper and probably as well as by Government agency, and it is probably preferable that he should himself undertake the work, but it may be found necessary to employ Government agency. In that case I urge that the occupant of the land should have the option to cart all material and with his family do all digging and rough work requiring ordinary labour. The value of such work at ordinary hiring rates to be deducted from the total outlay, the difference should be a burden on the land recoverable like assessment—principal and interest to be repayable in easy instalments spread over a long term of years. Government should bear all loss if the well fails to provide a full supply of good water at a reasonable depth in a year of average rainfall.

27. Under existing conditions the administration of the *takavi* system, the agricultural development of the Bombay Presidency, and the general efficiency of the Revenue Service are greatly hindered, because the men employed in the Subordinate Revenue Service are not properly trained to their work. This will soon in part be remedied. As

Paragraphs 28 to 34. bearing on existing inefficiency I put the following note before the Famine Commission, which I do not wish to modify in any degree:—

"28. I feel strongly that the Bombay Subordinate Revenue Service would be considerably strengthened if recruited more extensively by agriculturally trained men. The rules regulating the work of Circle Inspectors, District Inspectors and Superintendents of Land Records and Agriculture clearly contemplate that such officers should have special knowledge in agricultural and survey work. It is clearly laid down that Circle Inspectors shall watch the season in their circles, and detect as early as possible signs of crop failure and coming distress. They must watch fluctuations in prices, the conditions of the people, cattle and crops, the supply of drinking water, diseases affecting man and beast. They are required to study the varieties of crops and crop mixtures, rotations, cultivation, manures, crop diseases and blight, also to estimate outturn in auras. They must check returns of population and agricultural stock, village estimates of areas under different crops, also irrigated dry-crop and doubled-cropped areas. The Circle Inspectors must further be educated in survey work as measurers and otherwise.

"29. The District Inspectors and Superintendents of Land Records and Agriculture exercise a superior check on the work of Circle Inspectors. Statistical and other returns are passed on by Circle Inspectors through District Inspectors, Mahalkaris, Mamlatdars, Assistant Collectors and Collectors to the Director of Land Records and Agriculture, for compilation.

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"30. It is, I think, certain that approximate accuracy in agricultural and statistical village returns can only be secured if supervised by agriculturally trained men. At present the Circle Inspectors in the Bombay Presidency, who do the most reliable work, are, I believe, old survey men, who, owing to the winding up of the survey, have been compulsorily retired from that department. They were trained in that department to active out-door work and to appreciate in a practical way agricultural facts and operations, and as Circle Inspectors such training has been found valuable.

"31. It is unlikely that agriculturally trained men will accept Circle Inspectors' posts of Rs. 25 per mensem unless they can by ordinary promotion and good work rise in time to be Mamlatdars. I do not suggest the necessity of special promotion for any agriculturally trained man. At the same time there can be little doubt that such men as show special aptitude and reliableness at work would have more or less of a lien on such posts as District Inspectors, Price Inspectors, Superintendents of Land Records and Agriculture, and in responsible posts in the Department of Land Records and Agriculture. The clerical and supervising establishments controlled in his own office and on Government farms by the Deputy Director of Agriculture should be recruited from agriculturally trained men whose prospects of promotion should not be inferior to the prospects of men who join the Revenue service.

"32. It is necessary to explain the term 'agriculturally trained'. The Bombay University gives a degree in agriculture. The syllabus has recently been revised and the pass test stiffened. In order to gain the degree a thorough practical out-door or field knowledge is now fully as essential to the student as book or class-room learning. The course extends over three years. A student must pass the Previous Examination, which is a higher test than Matriculation, before he can enter the agricultural course at the College of Science, Poona. This preliminary test is the same as for students who go up for other University degrees and is a guarantee of sound general education. Afterwards the agricultural student must pass three University examinations. The first before he can pass to the second year's course, the second before he can pass to the third year's course, the third in order to get the degree. The practical training can adequately be given at the Poona Government Farm (on which are residential quarters for students) and by excursions. As far as possible object lesson plots are arranged annually, to familiarize students with numerous field and garden crops of the Presidency and the conditions under which they are successfully grown, and further to illustrate, practically in the field, the class-room teaching. There is a complete collection of indigenous agricultural implements at the farm and an excellent museum collection of agricultural and economic products at the College and in the Director of Agriculture's office. The teaching staff and equipment at the College of Science are sufficient.

"33. The Bombay Government has ruled that in future Agricultural degree-holders shall gain admissions into the Revenue Service on precisely the same footing as other University degree-holders. The effect has been that the agricultural classes at the College of Science have revived. They had dwindled to a single student in 1899. Twelve joined in 1900, and I understand that 13 new students have joined this month (January 1901). Poona will be a centre of training for other provinces as well as Bombay and I urge the need of a general ruling regarding the employment of such men in all provinces and particularly in

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the Department of Land Records and Agriculture. In the latter Department, even in Bombay, the prospects of graduates in agriculture are indefinite.

"34. I advocate strongly that Bombay Civilians, after they are, say, a year and a half in the country, be sent to the Deputy Director of Agriculture during the monsoon in Poona for two months to be taught something regarding the crops, the implements, the soils, the cattle and generally regarding the agricultural conditions of the Presidency. I am sure they would find such teaching valuable afterwards in ordinary district routine work."

35. It is impossible to state, except in general terms, the increase of produce obtained by the various systems of irrigation throughout the Presidency. The conditions vary extremely between districts as regards the kinds and value of crops, which can be successfully grown, as regards available supplies of manure, as regards the adequacy or precariousness of water-supply and as regards actual cost of applying irrigation; therefore the question of profits can only be generalised. I am prepared to discuss orally the conditions as they exist in the various districts of the Presidency.

36. It can be put in evidence that the supply of water in existing wells has been considerably improved in years of drought by deepening and by boring in various parts of the Presidency. The Agricultural Department is, I believe, collecting detailed information. The evidence at hand clearly indicates that owners of existing wells might be helped considerably if proper boring apparatus was made available in the various districts. The rude boring apparatus now in use can only be successfully employed when the substrata are comparatively soft and free from layers of fine sharp sand.

37. Reference has already been made in this note to the necessity of extra supplies of manure for any extended scheme of irrigation. The important question is: "Are such supplies procurable?" It may be answered in the affirmative. There is evidence at hand that when manure is urgently needed for irrigated crops supplies which are

ordinarily at hand and not generally used for dry crops, are eagerly in demand for irrigated crops. I can from personal knowledge, state that in every district where well irrigation is extensively practised that the dung and urine of cattle, litter, leaves, tank mud and other useful organic matter, household waste and in some out-districts night-soil, are collected with scrupulous care and are much better conserved than before there was extension of well-irrigation. In the neighbourhood of some large towns poudrette is freely used for irrigated crops. It is dear where there is great demand, and cheap where the demand is limited. The extension of the important market garden cultivation in the neighbourhood of Surat has been dependent upon supplies of town manure, chiefly crudely made poudrette. The stuff is still sold at a cheap rate because supplies are yet more than sufficient for requirements. The Bombay Agricultural Departmental experiments with sugarcane at Manjri near Poona have proved that certain edible cakes which can be procured in large quantity at cheap rates give better results than the manure cakes in ordinary use. These manure cakes (castor and karanj cakes) are dear because largely in demand for irrigated crops. The cane cultivators have recognized the special value of the edible cakes referred to, and are now using them in the Poona District as manure for sugarcane. The practice of growing San (*Crotalaria juncea*) and other leguminous crops, as green manures, will become more common as well-irrigation extends. Everywhere in the Presidency the system is already recognized as a very useful source of manure.

I do not think that the cultivators of irrigated crops in the Presidency require to be taught anything regarding the value of rotation as a substitute to some extent for manure. Under canal irrigation probably sugarcane and some other crops are taken too often in succession, but usually under well-irrigation a remarkable knowledge of scientific rotation of crops is shown.

38. I have found it convenient to give information regarding the various questions put by the Irrigation Commission in narrative form. I hope I am not out of order in doing so.

1. Q. *The President*.—You have been 11 years in this Presidency, I understand?—Yes, I was first Superintendent of Farms and then Deputy Director of Agriculture in Bombay and now hold a Government of India post.

2. Q. Are these farms your creation?—The Surat and Manjri farms are; the Poona farm existed before I came to the country; it has been extended a good deal since to carry on special experiments and special work.

3. Q. You say in paragraph 5 of your note that the initial cost in determining whether a well is likely to yield sweet or brackish water, is small?—Yes, it is trifling in Gujarat but serious in the Deccan. In Gujarat you have to dig through comparatively soft soil before you get to the water-bearing stratum; in the Deccan you would have to dig first through soft materials and afterwards through hard muram and trap rock, causing great expense. The actual stone or brickwork building is not so expensive in the Deccan as in Gujarat because the hard trap takes the place of actual building to some extent in Deccan wells. Sometimes a Deccan well is only built up in the side on which the leather bag works.

4. Q. Supposing an ordinary cultivator wishes to place a well near his village, how does he set about finding whether the water is salt or sweet?—There would be no great risk in the Deccan, because salt water is rarely met with; in Gujarat there is grave risk in some tracts of getting brackish water, he cannot make certain, he must do the *kachcha* work.

5. Q. Do you recommend getting boring instruments in each District of a superior kind and a mechanic to work them for the sake of giving this information to the people? I should like to test that plan before it is applied extensively, I should not like to do it wholesale.

6. Q. Natives have boring instruments of some sort?—Yes, but they are not applied to initial work, but in existing wells to deepen them and find a lower stratum of water.

7. Q. There is no doubt that by the use of Norton's tubes one could find this out?—Yes, specially in Gujarat where it is easy to work in the soft alluvial soil and subsoil.

8. Q. We have had a proposition that it would be a good thing to have at each of the District head-quarters boring apparatus which could be lent?—Yes, it would be a good thing.

9. Q. You say in paragraph 6, talking of the *kachcha* wells "these wells were of course useless after the following monsoon" and again in paragraph 7 "it is not possible to dig *kachcha* wells so successfully in black soil or mixed black soil tracts, because the wells after use for a short period have a tendency to fall in"?—*Kachcha* wells in alluvial soil last until heavy monsoon rains loosen the sides, then they have a tendency to fall in. *Kachcha* wells in *bhatta* soil on the banks of the Nerbudda and Tapi are dug at a trifling cost every year; the depth to water is sometimes only 12 to 13 feet. The silt of flood water fills most of these wells up annually.

10. Q. (*Mr. Ibbetson*).—Have you any tracts in which a *kachcha* well would last five or six years?—Yes, in parts of the Panch Mahals and in the black soil parts of Ahmadabad, also generally in the Deccan *kachcha* wells would last for some years; the cost of making them *pakka* would not be great and therefore, there would be no particular advantage in leaving them *kachcha* for any length of time.

11. Q. (*The President*).—Is there any rice irrigation to speak of on wells?—Not much on wells alone, but there is the risk of a tank failing towards the end of the season, and the owner of the crop would be glad to have a well at hand.

12. Q. (*Mr. Muir-Mackenzie*).—Do they use wells for rice?—Yes, they do, only as an auxiliary to tank irrigation; if a tank fails rather than lose the crop they would irrigate from wells.

13. Q. (*The President*).—Do you attach much importance to the extension of tank irrigation and the repair and maintenance of tanks?—Yes, a good deal of importance particularly if the tanks are small and if the people of each village control the distribution of water from their own tank; I would consider an extension of small tanks thus used much more important than the extension of large tank irrigation which could not be equally well controlled by village communities.

14. Q. Still the water lasts longer in a big tank?—I have seen big tanks in the Deccan where the disadvantages outweigh the advantage you refer to.

15. Q. Of course the size of the tanks must depend upon the configuration of the ground?—Quite so, not so much in Gujarat, because it is a comparatively level tract. In almost any position you could make a tank if you could get a little flow of water, because the depth of black soil is such that you could remove a foot of the surface soil without lowering the fertility.

16. Q. I suppose you would count upon cultivating the bed of the tank when the water is off?—As a matter of fact this is not an uncommon practice in the Presidency.

17. Q. You say in paragraph 11 "the deep alluvium of Kaira and Ahmadabad, particularly if sandy in character, needs water very frequently, and a single *kos* will not irrigate more than 2 acres." And again in paragraph 13 "in the famine year it was possible to irrigate from a two-*kos* well three crops on three different areas covering altogether 10 or 12 acres of ground." I suppose a double-*kos* well would do twice as much work as a single one?—Yes, if the land is near, each *Kos* would, if the water lasts, irrigate 6 acres between September and the following May. Three crops, each occupying 2 acres, would be taken in succession on different areas commanded by the same well.

18. Q. Would that be a *Kos* working day and night?—Yes, but only towards the end of the season, but not necessarily between September and February.

19. Q. Did the level of water in the wells sink much in the famine?—In the famine year one season's drought did not materially lower the depth of water in the older and better wells in the deep alluvial tract of Kaira and Ahmadabad and the Panch Mahals.

20. Q. (Mr. Muir-Mackenzie).—Do you say that from personal observation?—Yes, one year's drought does not diminish the supply until the following hot weather, in the alluvial tract. In the black soil the supply did fail.

21. Q. (The President).—You say in paragraph 12 "the fodder produced from well-irrigated crops throughout northern Gujarat in 1899-1900 was the means of keeping alive many of the cattle which survived the famine; what happened to the cattle where there was no well-irrigation?—They mostly died. We have in the Bombay Presidency 4 million less cattle than there was in 1896-97, the traffic in hides in Gujarat and adjoining Native States in the famine year indicated that the chief losses which occurred that year occurred in these parts. Our census, which was taken in June, indicated that nearly 70 per cent. of the Kaira, Ahmadabad and Panch Mahals cattle died and that is, I consider, an underestimate, probably before the rains came more cattle died. The change from dry fodder to green food at that particular season is so severe that it is the cause of mortality in any year and was probably the cause of great mortality in the famine year when the cattle were much reduced in condition.

22. Q. You say in paragraph 14 "throughout Broach excepting the alluvial belt along the Tapti and the sandy belt along the coast, the soil is deep black cotton soil. On such land rice beds have been successfully formed and irrigated by village tanks and more could be formed. The soil is entirely unsuitable for the cultivation of other crops." Is the soil upon the alluvial tract suitable for irrigation?—It is well protected by irrigation from shallow wells now.

23. Q. How wide is this belt?—Not a mile wide; the Nerbudda belt is wider.

24. Q. Would the alluvial tract on the Nerbudda be helped by a canal?—It is very narrow. A canal would do no harm. I think a survey should be made. I am not very well acquainted with the whole tract. I should say the extent is such that it is not worth while to construct a canal specially for it. The alluvial belt on the Tapti is protected by *kachcha* wells which are dug every year, or on higher lands, by *pakka* wells.

25. Q. Have you seen anything of the pumps for raising water from rivers?—I know a little about them but not much.

26. Q. Is this system coming into vogue here?—At Nausari, in Native State territory, a man intends to do a little in that way.

27. Q. Do you believe in it?—Yes, if the soil is suitable.

28. Q. Would it stand the expense?—Fuel is expensive; probably the cost would be found after enquiry, to exceed well irrigation by bullocks, but I am speaking without any definite knowledge.

29. Q. I understand that you think on black soil rice can be irrigated with advantage?—Yes, by means of small tanks.

30. Q. Could it be irrigated by a canal?—Not with advantage in any part of Gujarat, because such irrigation would spoil more land than would be under rice. By leakage from the canal, I should expect water-logging and salt efflorescence, and I also think that the people would not use canal water so economically as well as tank water for rice.

31. Q. The question is whether you can utilize the water of these rivers or should you allow it to go to the sea?—I should be sorry to see a large scheme tried in either Broach or Surat; I would rather see the water wasted than used there; I should expect that a good deal of land would go out of cultivation and that a good deal of land would be spoiled.

32. Q. Water-logging can be remedied by drainage?—Still you have the extra expense of drains, the chances are that open drains would want to be cleared every year. They would be filled up with black soil. That has been our experience on the Surat farm.

33. Q. Still it is just a matter of money with you?—I should be very sorry to see a canal carried where we have black soil, especially for rice cultivation; pure black soil is absolutely unsuitable for any irrigated crop except rice. Deep black soil, as you find it generally in Gujarat and in practically the whole of Broach, holds when wet a large quantity of water and the sub-soils are of clay-like character and therefore impervious to moisture; when you have that combination, the conditions are such that no irrigated crop can be successfully grown except rice. There are in the Surat District restricted areas of soil which is not pure black. That portion of the Surat farm which is irrigated has soil of this class. We have found that the value of the crops grown under well irrigation does not warrant the expenditure incurred for deep wells, heavy dressings of manure and drainage. No ordinary cultivator would have incurred the expense.

34. Q. Our particular object is to enquire into the means of protection against famine; it is a serious responsibility to reject two large rivers?—I can only say that according to my convinced belief canal irrigation for rice in the black soil parts of Gujarat will do no good. It will probably do harm and I should be sorry to accept the risks. The case is entirely different in respect of the alluvial soils of Northern Gujarat and of Baroda territory.

35. Q. Have you seen the irrigation in the Madras deltas?—No.

Mr. Rajaratna Mdlr.—The soil there is not true black soil.

36. Q. Do you know the Tapti district?—Yes.

37. Q. What is the soil like?—The soil throughout Khandesh for 2 or 3 miles on either side of the Tapti is like that in Broach, then you get into uplands where the black cotton soil is 3 feet deep or less overlying muram. On the black soil along the Tapti it is only possible to grow *rabi* crops, because the soil gets so sodden that no *kharif* crop will grow. In this river-side tract *rabi* dry crops of wheat, gram, and linseed are taken in rotation. Khandesh is a *kharif* district except in this belt.

38. Q. (President).—I understand that while down here in Broach and Surat there is a belt of alluvial soil which stands irrigation, further up the river-side belt consists of deep black soil?—Yes.

39. Q. Is it safe to irrigate on *gorad* land?—Yes, perfectly safe.

40. Q. Do you know anything of the proposed irrigation works of the Sabarmati?—No.

41. Q. Have you seen the Hathmati?—No.

42. Q. Nor the Khari cuts?—No.

43. Q. I have been puzzled how it is that in this country there is very little irrigation bestowed on cotton; in Egypt it is a highly irrigated crop; why is that?—Egyptian cotton differs in variety from any indigenous Indian variety; that may be one reason.

44. Q. It is not impossible to irrigate cotton in this country?—If a man goes in for irrigation at all, he selects crops which will pay better than cotton, such as garden crops.

45. Q. In Egypt you could not possibly grow cotton without a good deal of irrigation?—In Egypt you are dealing with alluvial soil, in the Bombay Presidency the cotton soil is chiefly black soil which does not suit irrigation.

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46. Q. In Egypt it is not that the crop won't stand it, but it cannot possibly do without it?—That country has very little rainfall, Broach has a rainfall of over 40 inches, I should say that the circumstances are such that you require irrigation in Egypt but not here, with the rainfall that is usually got.

47. Q. Do tanks ever get brackish?—Not in my experience, but I cannot speak positively.

48. Q. You say in paragraph 17, "the information given in the foregoing paragraphs in reference to the various districts of Gujarat indicates that considerable extension of irrigation is practicable; there are, however, risks which must be kept well in view." To what do you specially allude?—To the risk of getting salt water in the wells for instance.

49. Q. Have you had any experience of the effects of drainage on water-logged land?—No, I should like to try the experiment. In one taluka of Surat a good deal of land has gone out of cultivation owing to the effect of water-logging. In this water-logged area the crops are not so valuable and more risky to grow than those on drier land; people have been compelled to grow *rabi* crops instead of *kharif*. I don't see any reason why, by drainage or other improvements, land that has got out of cultivation should not be successfully brought under cultivation again.

50. Q. What is the taluka you spoke of?—Olpad.

51. Q. Can one buy artificial manure here and is it within the range of the cultivator's purse?—Oil-cakes and other indigenous manures can be bought.

52. Q. Does it pay to buy them?—Yes, we have made experiments with sugar-cane which prove that certain edible cakes which are not used as manure are more effective than manure cakes in ordinary use and can be bought at cheaper market rates. People do not generally know that these edible cakes are valuable as manure. Oil cakes can easily be broken up into powder for use as manure under the mill stone which is used in every village for making mortar.

53. Q. Do you believe that, generally, throughout the country it would pay the cultivators to use oil cakes and other indigenous concentrated manures?—Yes; certainly for irrigated crops.

54. Q. Are oil cakes manufactured largely?—Yes, in every village, the oil is used as food, the cakes are used as food for milk and work cattle locally and are exported also to towns. They can be stored for any ordinary length of time as cattle food.

55. Q. There is no want of them in the country?—If there was a large extension of well irrigation, I have no doubt these cakes would get dearer, but we have also *san* the use of which as green manure could be extended.

56. Q. (Mr. Ibbetson).—You mean the yellow pea which we call *sanai* in Northern India? With us *san* is a mallow?—Yes, Mr. Fuller told me that the cultivators in Central India object to grow this crop on account of caste prejudice, but there is nothing of this in the Bombay Presidency. In various parts of the Presidency when the need of manure arises the cultivators save up night soil.

57. Q. (Mr. Muir-Mackenzie).—Would it pay to use oil-cake manure on cotton crops?—No.

58. Q. Cotton crops grow well after *san*?—Yes.

59. Q. The practice of using *san* is not common?—No.

60. Q. (The President).—Taking all these things into account, what do you think would be the most judicious course for the Government to take to fortify the country against the bad effects of another famine?—I would extend wells in every suitable position, provided it was certain that all the manure required would be available, that all the bullock and manual labour necessary could be commanded and that the men who owned these wells had sufficient capital on credit to do full justice to the work.

61. Q. These are important conditions, I suppose it follows that well irrigation in any tract would never rise to 20 per cent. of the tract?—If it rises to 10 per cent. I should be glad.

62. Q. That is the best that can be offered?—In Gujarat on black soil the extension of small tanks for rice would be extremely important. I see that Mr. Mehta thought that they could not be extended in Broach because of the difficulty of labour. I think if the occasion arose that labour would be forthcoming. On the black soil which fringes the Tapti in Khandesh, where linseed, gram, etc., are grown, the question has been solved, as many hill people from the

Ghats come down periodically in order to help in the reaping of the crop. I should say that labouring people would be attracted if the work existed.

63. Q. (Mr. Higham).—You don't think that the objection to the extension of irrigation without manure would occur?—No, I think the manure will be available in reasonable amounts.

64. Q. If canal irrigation is introduced on as large an area as 34,000 acres, will manure be available; you are only speaking of well irrigation?—Yes, I refer particularly to sufficiency of manure for well irrigation and by small tanks. This is the only description of irrigation I recommend for Gujarat.

65. Q. The canal irrigation might run ahead of that supply of manure?—Yes, there are other serious drawbacks to that, I anticipate the soil being spoiled by canal irrigation.

66. Q. Not in all cases?—No, in the Mutha canal irrigated tract of the Poona District manure in sufficient amount is available. The effect of canal irrigation has been that a good deal of the land has already gone out of cultivation on account of water-logging. To my knowledge the crops that are produced in that part now are not nearly so good as they were five years ago on account of the land being now surcharged with water. The soil is a medium black soil with muram.

67. Q. Has not drainage been tried there?—No, there is no combination between the people who occupy the land, one occupant cares little for the interests of another and the canal irrigation is doing a good deal of harm.

68. Q. I suppose from your Poona experience, you think canal irrigation should not be contemplated in any part of Gujarat?—Not in any part of the black soil of Gujarat. In the alluvial soils it would be useful if the water is regularly distributed and if manure in sufficient quantity is available. I would expect more harm than good by making canals in the black soil part of Ahmadabad. The wells become periodically salt in the talukas west of Ahmadabad.—If the proposed Sabarmati canal passes through these parts salt efflorescence will increase. I have seen a good deal of land which has already gone out of cultivation on account of salt efflorescence in these parts.

69. Q. (The President).—It has never been drained?—No, I doubt if it would be possible to drain it. The country is very flat and very wet in the rains.

70. Q. (Mr. Higham).—In regard to the Broach District which is, I think, all strong black soil, do you consider that rice cultivation in these parts where they have tanks, is more profitable than growing cotton and *juari*?—No doubt it is, but then the expenses are more than on dry crops.

71. Q. The profits of cultivators on rice would not be greater than growing cotton and *juari*?—They would, I think, be usually greater, the rice crop would be safer provided it got, late in the season, two or three waterings in a year of average rainfall.

72. Q. I understand on the whole there is greater chance of the cotton crop failing than there is of rice, if you have proper tanks?—Yes, certainly.

73. Q. The tanks make it more secure?—Yes; in Broach and Surat where there is generally too much rain for cotton.

74. Q. But not otherwise more profitable to the cultivator?—A good crop of rice irrigated from a tank properly manured is worth Rs. 80 to Rs. 100 per acre, an average crop of cotton is not worth more than Rs. 25 to Rs. 30.

75. Q. Do you think Government would be justified in making tanks or in helping in their construction in the District of Broach?—Yes, provided they are small and provided each village controls its own tanks and each community is made responsible for repairs and clearing as required.

76. Q. If more than one village controlled a tank what do you fear?—Two villages might perhaps pull well together.

77. Q. And in the case of a large tank?—I want to see the people hang together in such a manner that they would absolutely control the water, and that every owner of a rice bed gets a fair share of it.

78. Q. There is not much scope for extending tanks in Broach because the country is so flat?—Still you can improve the position by digging out your rice beds, the depth of the soil in Broach is such that you can afford to dig a foot or two and impound rain water; I should say there is very great scope for that in Broach.

79. Q. Would fodder be benefited by irrigation?—Not in ordinary years. In a famine year when fodder is required the cultivator who grows garden crops under a well changes

his practice and grows fodder crops instead, because it pays him to do so.

80. Q. Ordinarily the cattle here are fed on grass fodder?—Yes, also on *karbi*, straw of all cereals and *bhusa* of pulses; there is a large growth of grass in the Thana forests, the Dhangs of Surat and in the forests of the Tapti Valley, but much of it is so inferior in quality that it does not pay to transport it any distance.

81. Q. Where is the good grass sent to?—In Northern Gujarat there are very large areas which produce excellent grass. This grass now, to a large extent, goes to waste because the herds of cattle which grazed these lands are dead and no particular transportation takes place. A small quantity of the grass is taken to Bombay. A great deal more transportation could be done.

82. Q. There are ample waste lands for the growth of fodder?—Yes, ample in Northern Gujarat.

83. Q. It is not necessary to increase the area?—No.

84. Q. What is the amount of fodder that you require to give a pair of bullocks for six months?—A full grown bullock would eat in the course of the day 15 pounds of grass. On that grass alone he would not survive on account of its innutritious nature; there should be an addition of $1\frac{1}{2}$ to 2 pounds of oil cake, that would be the amount for a full sized Gujarati bullock.

85. Q. That is for a Gujarati bullock, I suppose a smaller bullock would not eat so much?—No.

86. Q. What would be the cost of storing the grass, do you suppose, locally?—On the Charodi Farm west of Ahmadabad where we have 600 head of cattle we put up in the year after the famine sufficient to make it certain that there would be about a full year's supply always in hand; that cost us at ordinary rates Re. 1 for 1,300 bundles of cut grass collected in one heap; 1,300 bundles are practically equivalent to 1,000 pounds of grass; cutting, tying and stacking cost us Re. 1. I got two hand presses from the Forest Department, so that we could press this grass into compact bales. I also got wires which had been previously used. The baling cost about Re. 1 per thousand pounds, so that the total cost came to Rs. 2 per thousand pounds. It would be impossible to keep baled grass safely through the ordinary rainfall unless it was protected by corrugated iron sheets. We put up two big Dutch barns using railway rails for supports and corrugated iron for roof. In that way it was very easy to stow away sufficient supply for the cattle on the farm. If it pays to do that on a small scale it would pay to do it on a large scale. I advocate storage on a large scale in the Western talukas of Ahmadabad. Labour is cheap and if the stuff is kept until the following rains it could be sold at a profit if the rains are favourable.

87. Q. What is the supply at this farm, have you a supply for 12 months?—There is more than a six months' supply.

88. Q. Do the people show any disposition to preserve fodder in that way?—No, I have not seen anything of the kind among ordinary agriculturists; they trust to the average outturn from arable lands being sufficient.

89. Q. You say this grass goes to waste in Northern Gujarat: is there any market for it?—Yes, a certain amount, but the stuff is so bulky that even in pressed bales it pays the railway better to carry more concentrated stuff.

90. Q. Would it pay to send it to Bombay?—Grass is sold in Bombay at from Rs. 10 to Rs. 11 per thousand pounds and that is inferior to what is produced in Gujarat.

(Mr. Ibbetson).—Before commencing my examination, I should like, as one of the Revenue Members of this Commission, to thank you, Mr. Mollison, for your valuable paper; it is, I think, one of the most interesting and informing papers which has yet been laid before us.

91. Q. I see you are evidently strongly in favour of small tanks as opposed to large tanks, what is your objection to large tanks?—The water is not so well controlled as it is in small tanks: there is also the risk of salt efflorescence and the risk of land going out of cultivation on account of being water-logged.

92. Q. Would that apply to all soils?—It would not apply to soils that absorb water easily; it would not apply to alluvial soils as much as to black soil.

93. Q. In alluvial soils would you prefer small tanks?—Yes, if you could get as much irrigation altogether from the small tanks as from a certain number of large tanks.

94. Q. The evidence laid before us goes to show that large tanks are superior to small, being more efficient and more certain of a water-supply, and I think that in some ways the water is even more under control on large tanks.

Do you think that, if sluices are provided for the distribution of water, the people would be able to distribute the water by means of small tanks with less injury to their own land?—Yes, I think so. I can call to mind one particular tank in the Dharwar District where much damage was done by water-logging.

95. Q. On a canal in Northern India that I know very well, exactly the same thing happened; water was given profusely, and we had thousands of acres thrown out of cultivation by water-logging and salt efflorescence. Of late years the canal authorities have restricted the supply of water of each village by giving them pipes of dimensions so calculated as to give just enough water for the land they have to irrigate; that restriction, combined with drainage and the realignment of the canal, has removed the evil of water-logging entirely and is gradually removing the efflorescence. Do you think among these people in Poona a similar restriction of water could be effected?—I should like to see it tried; there is great room for improvement in the distribution of water.

96. Q. I understand your fear is that the people would not distribute the water fairly?—Yes; and another difficulty is that the supply in any canal that I know of in the Deccan is not perennial; if there are insufficient October rains the chances are that water will fail when it is most wanted; if you put on the restriction that you name, it might be that the fields near the canal would get a full supply and others probably would not.

97. Q. Would not the effect of restricting the supply materially be to increase the amount of water, that is, to economise the water and so render the supply less liable to fail?—There is no doubt that a great deal of water goes to waste now owing to the intermittent system on which it is given and the beggar-my-neighbour system on which it is taken.

98. Q. If you restricted the supply and made them economise the water, would it not last longer?—If you were dealing with a village community that might answer; but in the case I refer to the land has gone out of the hands of the community into the hands of speculators and contractors in Poona; these men sub-let it to others; it is very difficult to make the cultivators co-operate in the same way as in an ordinary village community.

99. Q. Setting aside the contractors for the moment, you seem to have doubts whether you can get the people to distribute their water fairly. If you anticipate that difficulty, on what grounds do you advocate small tanks?—Because you are dealing with one village. Each man would take good care to get a fair share, if the same thing could be done with the restricted supply of a canal, you would have the same result as with one tank.

100. Q. You think if the restricted supply were given to each village separately, there would be no difficulty?—None.

101. Q. My fear is that precisely the same difficulties that you think would arise in the case of large tanks would occur in the case of small tanks?—I don't think so.

102. Q. (Mr. Muir-Mackenzie).—Are not the conditions of Poona somewhat peculiar?—Yes, no doubt.

103. Q. (Mr. Ibbetson).—What you say applies only to Poona?—Yes.

104. Q. It would not apply to, say, a canal near Ahmadabad?—No.

105. Q. I don't quite understand your point about irrigation in black soil; true black soil, you say, cannot be irrigated, except for rice. You said you had also tried a mixed soil unsuccessfully at your farm?—There is a description of black soil in the Surat district known as *Kali Besar* that can be irrigated with advantage. It has a porous sub-soil. On the Government farm we went to very great expense for wells, manure, drainage; the lighter soil is better suited to garden cultivation.

106. Q. Is there a description of black soil that can be irrigated with profit?—Yes, in Surat; it is not pure black soil, it is a light black soil and has a porous layer underneath; that combination is suitable for irrigation.

107. Q. (Mr. Muir-Mackenzie).—On the farm you have had certain crops which have done very well?—At the same time we have gone to very great expense as regards manure and in the construction of wells.

108. Q. (Mr. Ibbetson).—To return to this lighter black soil which is suitable for irrigation and exists in Surat, is that found in other parts of Gujarat?—If you exclude the risk of salt you will find it in the black soil cotton and wheat district of Northern Gujarat, it also exists in the

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Deccan and Kathiawar. Provided the soil is thick enough, it is suited for tank irrigation from which there is not the same danger of salt as in well irrigation.

109. Q. Where that soil exists in Gujarat there is danger of salt?—Yes.

110. Q. Is the area under it considerable?—Yes, very considerable.

111. Q. Salt would render well irrigation risky?—Yes.

112. Q. Now, returning to the subject of the extension of well irrigation, you say you would be very lucky if you got 10 per cent. of the tract irrigated by wells?—Yes.

113. Q. Do you mean 10 per cent. of the whole district or of the area suitable for well irrigation?—Probably 80 per cent. of the Deccan is unsuitable for well irrigation, 10 per cent. in a district like Khaira, where the whole tract is suitable for well irrigation, would not be too low.

114. Q. Supposing that in Gujarat as a whole you had wells wherever it was advantageous to have them; what portion of Gujarat do you think would be irrigated?—I should not like to commit myself.

115. Q. Certainly much less than one-tenth?—Yes, except Kaira.

116. Q. In Kaira what would be the maximum that you could irrigate from wells?—I doubt if you could go beyond 10 per cent. on account of the deficiency of the manure.

117. Q. You could not have, say, 55 per cent. as in the Punjab?—No, count must be taken of the cost of raising water from deep wells and the need for heavy dressing of manure to make the crops really good and really profitable.

118. Q. To take another proposition. Take the *kachcha* wells that were made in the famine; you say that *pakka* wells might be made in place of each of them; suppose Government could make these wells *pakka* by a stroke of the pen, could they at once be used to advantage?—Is the manure and labour sufficient?—I should not like to do it in one year. I should like to proceed gradually; the manure and labour would be provided gradually as required.

119. Q. The number of wells is steadily increasing in Gujarat year by year, are they not?—I have not the figures, but should imagine there is no doubt of it.

120. Q. Do you think the increase in the number of wells is about as great as the increase in manure and of labour would allow of being worked profitably?—No, the increase might be much quicker, but of course there is a limit.

121. Q. Do you think there might be a further increase without outrunning the supply of manure and of labour?—Yes.

122. Q. Do you think Government should build wells?—No, it would be better if the cultivators could be got to do it, making it absolutely certain, that if he means to borrow from Government he will get the whole of the money required.

123. Q. The best thing would be to give cultivators all the facilities possible for borrowing?—Yes.

124. Q. Can you suggest anything more?—I think it would help materially, if a cultivator constructed a well (it does not matter whether he borrowed the money or builds it out of his own funds), if a premium were put on each acre that is brought under cultivation in the first year, say from October to March, provided that the water got was sweet and therefore suitable for good grains.

125. Q. What sort of premium?—I should not hesitate to say Rs. 25 per acre for the first year, that would be about Rs. 200 for a well.

126. Q. The well would cost about Rs. 1,000 or 1,500?—Yes.

127. Q. Would not that Rs. 200 be thrown away in the case of a man who was going to make a well in any case?—No, he would do more justice to his land and give it more manure, and therefore get good profitable crops at once.

128. Q. About small tanks, take the case of the repairs that have to be done annually; I have asked many witnesses who know the people well whether they have any hope of getting the people to do these repairs, and the opinion has been overwhelming that practically it is hopeless?—Why?

129. Q. Want of combination has been mentioned as one of the reasons?—It could be done more economically by the people.

130. Q. I agree that it is the best thing if it is possible, but witnesses tell me it is not?—I don't agree with that. I think the repairs should be done by the people. They should be compelled to do them. At the same time there is

some risk in clearing out a tank annually; it would hold less water.

131. Q. Why should Government go to the expense of repairing these small tanks. Half a dozen men would do the work for themselves?—They have no money; besides they have to pay enhanced land revenue, etc.

132. Q. As regards the proposal to store hay, how long would it keep if stored?—An indefinite period if properly baled and protected.

133. Q. You say that the market price of hay is never less than Rs 10 to Rs. 11 per thousand pounds in Bombay?—Yes.

134. Q. What would it cost to send it to Bombay?—I believe as regards the Tramway Company that after paying all expenses of baling, etc., in an ordinary year (and they pay for right of cutting grass a good deal more than the Government assessment), it costs them somewhere between Rs. 8 and Rs. 9 per thousand pounds landed in Bombay; that amount includes everything; that was my information three or four years ago.

135. Q. You say in paragraph 12 "in the famine year (1899-1900) although the general area under irrigation in the Presidency declined, the well-irrigated area increased by about 100,000 acres." That was because of the *kachcha* wells that were added?—Yes.

136. Q. To what extent is that land manured?—The manured area in Kaira and Ahmadabad is about 75,000 acres.

137. Q. At what season of the year is the manure applied?—You say the manure was to spare from dry cultivation owing to the failure of the rains?—In Gujarat manure is not put into the soil until after the first fall of rain. Tank mud is spread on the surface before the rain, but not farm manure.

138. Q. (Mr. Rajaratna Mdir.).—You referred to the difficulty of procuring manure?—I believe I stated that there are possibilities of procuring considerable quantities of manure for any extension of irrigation.

139. Q. What are the possibilities?—In certain well irrigated tracts in the Deccan, the necessity for more manure has become evident to the people themselves, and they save up materials which formerly were not used, such as night-soil, household waste, litter and even cattle urine; there are besides other sources of manure that have not yet been fully exploited, such as oil-cakes and green manure.

140. Q. Do you think the raysats will be able to solve these difficulties?—Yes. In Poona we began to use manures other than the ordinary. For instance we used cotton seed as manure for sugar-cane, and the effects were such as to justify the belief that it would pay the ordinary cultivator to use it; we also used certain edible cakes that can be obtained at cheaper rates than castor and karanj; these edible oil-cakes can in some Deccan Districts be bought at 70 lbs. per rupee; they are richer in nitrogen, etc., than those usually used; they are not so dear, weight for weight, as the ordinary manure cakes, and are more valuable as manure; show the people experimentally that these edible cakes are useful and they will use them. We showed their effect in the district and the result is that many cultivators use edible cake who formerly used ordinary cake.

141. Q. Are leaves of trees used as manure here?—No; except in the Kanara District; but *san* is sometimes ploughed in before planting sugar-cane and other garden crops. (Guvar, a pulse) is similarly used extensively in Gujarat.

142. Q. Have leaves been tried in the farms?—No.

143. Q. Have you seen the new reservoir constructed at Broach during the famine?—No.

144. Q. There is a large extent of land lying fallow in this Presidency in every district, is that reserved for grazing purposes?—Yes, in parts of Broach and Surat ordinary dry crop black soil often lies waste for several years and grows grass. When broken up and cleaned, the crops of cotton and *juar* grown subsequently are uncommonly good for several years.

145. Q. (Mr. Muir-Mackenzie).—In regard to fallow we find that in the Surat District the area cropped is about 480,000 acres and the fallow land measures about 270,000 acres. In ordinary years is the latter not more than you would expect?—What are the figures for Broach?

Q. Mr. Ibbetson. The cropped area of Broach is 564,000 and fallow 90,000 acres.

Witness.—I should expect the real fallow area to be more in Broach than in the Surat District. Grass lands are probably included in both districts, but the area of grass waste

in Surat (which is not necessarily unprofitable) is greater than in Broach. A very common practice in the Broach district is to leave certain land fallow. These lands are fallowed and cleaned in a very thorough way and an increased crop of cotton in the following year is obtained.

146. Q. (Mr. Muir-Mackenzie).—In Ahmadabad they have checked the figures:—1,178,000 cropped area and 4,04,000 fallow?—I have no doubt that the fallow area includes a good deal of grass land in Ahmadabad.

147. Q. You mean land kept by occupant in his holding under grass?—Yes, but not necessarily unprofitable.

148. Q. In Broach district, we have heard of cotton and rice being grown together?—Yes.

149. Q. Are you familiar with this mixed crop?—It is a practice common in Broach to grow cotton and rice mixed. It is done simply as a safeguard in ordinary years. If the rainfall is moderate cotton thrives; if the rain is very heavy there will be a good crop of rice. The rice is grown mixed in the rows of cotton or in an intermediate row by itself.

150. Q. If canal irrigation were applied within the cotton area for rice, would a profitable crop of rice be grown?—No, the rice grown with cotton is a special variety which suits the ordinary dry crop system of cultivation. With canal irrigation rice beds would be necessary and a variety, suitable for transplantation and regular irrigation, would be grown.

151. Q. You allude in paragraph 6 of your note to considerable scope for extension of irrigation by wells in the alluvial plains of Gujarat. For what crops do people take water?—For garden crops in ordinary years; for fodder, *juari* and food-grain crops in a year of scarcity.

152. Q. They would not in ordinary years take water for ordinary food crops?—No.

153. Q. Would the difference in yield not be sufficient to pay?—It might pay expenses, but cost of irrigation is very high and the garden crops pay best.

154. Q. In a district near the sea, where the cost of carriage would not be considerable, would imported manure be of any use to extend the manurial supply?—No, on account of the cost compared with available indigenous supplies.

155. Q. When the indigenous supply becomes dearer?—The occasion has not arisen.

156. Q. Mauritius uses large imports of guano, etc., for sugarcane?—Yes, on account of the scarcity of the indigenous supply. We are in a different position in Bombay. We export bones and oil-cakes. The latter especially would be kept in the country if there was any particular need of manure for extension of irrigated crops.

157. Q. Do you think with the available supplies of manure the best crops are grown?—In India, in the best sugarcane districts the value of the crops thus produced probably exceeds that of the best crops in Mauritius. We have in the Poona district time after time produced crops, yielding 12,000 lbs. of *gur* per acre, sometimes worth Rs. 1,000 per acre. In some districts well-irrigated garden crops are often worth Rs. 400 to 600 per acre. These figures indicate that with available supplies of manure, soil and water can be turned to the very best advantage.

158. Q. If the supplies of indigenous manures become insufficient and get dear, would the grower of cane and garden crops use imported manures?—I suppose so, but at present I see no need of importing any description of manure.

159. Q. You have grown sugarcane, have you not, with imported manure, on the experimental farms?—No.

160. Q. Not nitrate of soda?—The crude nitre used is a product of the country.

161. Q. Don't you think it advisable to make an experiment?—I do not see that any practical good would follow.

162. Q. Possibly not in this Presidency, but in other parts of India?—Nowhere in India would imported manures be useful for ordinary agricultural crops at present at the rates at which they can be imported, and I do not expect that they ever will.

163. Q. I understood the Honourable Mr. Lely to say that the results from *kachcha* wells were very disappointing?—That is not my opinion. In the Kaira Districts especially I saw numerous *kachcha* wells which gave surprisingly good results.

164. Q. The results were not different in different tracts?—I did not travel extensively through the District of Northern Gujarat in the famine year but in the parts I saw the results were good.

165. Q. In the tracts that you saw there was no difference?—No. It would, however, be easier in a district closed in by fences like Kaira for local officers to find out differences of this sort. I can only say that I saw numerous *kachcha* wells and the results were surprisingly good.

166. Q. I understand from Mr. Logan, Collector of Broach, that a considerable number of *kachcha* wells dug in the famine were not used this year?—*Kachcha* wells in the black cotton soil of Broach go out of use in a year, because they fall in. I saw *kachcha* wells in the bed of the Nerbudda in the famine year irrigating *juari*. In ordinary years the chief crops grown under them is tobacco. These Nerbudda *kachcha* wells are dug every year.

167. Q. (Mr. Ibbelton).—I understand *kachcha* wells never last beyond the next monsoon?—*Kachcha* wells in alluvial soil fall in partially at least after the first monsoon rain. A *kachcha* well in the Deccan with trap-rock below may last for years. It is advisable, however, that it should be made *pakka*. In the alluvial soil of Gujarat the labour expended on a *kachcha* well is generally lost if the occupant intends afterwards to make a *pakka* well? The diameter required for a *pakka* well is necessarily greater and it would be better to excavate for a *pakka* well in a place near the *kachcha* well than to extend the diameter of the *kachcha* well. The labour in digging a *kachcha* well in the Deccan is not lost because the sub-strata are hard and rocky.

168. Q. (Mr. Muir-Mackenzie). Have the *kachcha* wells of the Deccan, which were dug in the famine been kept in use?—I have seen *kachcha* wells dry in the Deccan and therefore not used, but if *kachcha* wells contained sweet water and the soil commanded was suitable for irrigation, I would be surprised if during recent years they were not fully used.

169. Q. It would not be advisable to give money for constructing wells to cultivators who were not enterprising?—No.

170. Q. Therefore it would not do very much good to give much money to the backward people in the Pauch Mahals?—No.

171. Q. In paragraph 8 you observe that rainfall is usually insufficient for rice. Would you say that it fails as often as two years out of five?—My experience is that it has certainly done so more frequently than that in the last five years in parts of Gujarat, especially Ahmadabad.

172. Q. You say the assessment is a fairly high one. How do you account for the people being able to pay it in spite of its being high?—The seasons during the last five years were very unusual.

173. Q. In ordinary seasons it would fail in two years out of five?—In those parts of Northern Gujarat where rice is grown and the average rainfall is light, and there is no particular protection from tanks or other source of irrigation, there is certainly a very poor crop or almost total failure of rice two years out of five.

174. Q. How do you account for their being able to pay assessment?—I do not think there is any great difference of assessment between rice fields and dry-crop lands in the particular areas I refer to. Dry crops during recent years have been grown in some rice beds and many rice beds lie now waste. The occupants could not possibly have paid assessment out of profits on these rice lands during the last three years.

175. Q. I understand you to say that there are plenty of sites likely to be available for small tanks?—Yes.

176. Q. From what have you derived that impression?—From my general knowledge of the country.

177. Q. Do you know this part of the country?—Perhaps not as well as the Deccan.

178. Q. Supposing you have small tanks, how would you proceed?—By digging rice beds underneath the tanks.

179. Q. By digging out rice beds underneath the tanks you would facilitate irrigation by flow, but you would not store the whole drainage from the catchment?—No; if you make the bank too high you will swamp as much land above it as you will irrigate below it.

180. Q. Now what would be the effect of this additional supply?—The small tanks would give people the surety of two or three waterings in addition to the ordinary rainfall, and therefore instead of having a very middling precarious crop they would have a good one.

181. Q. How would you ascertain the sites of the tanks?—Why not undertake surveys.

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182. Q. You would like to see surveys undertaken?—Most decidedly as regards tanks.

183. Q. Can many more new sites be found?—Yes; and if you put the matter in the hand of a practical man, he could complete his survey probably in one season.

184. Q. Would you prefer to extend and improve the existing tanks?—There is room for clearing a great many of them out certainly.

185. Q. And enlarging them?—I think that a survey should first be undertaken. It is very difficult to give an opinion on a broad question of this sort.

186. Q. Do you think it would be a good thing to encourage the digging of rice beds in black soil by granting *takavi*?—Yes, because with manure, labour and a good position, a very good crop could be grown.

187. Q. Do you think it would be a safeguard against the ordinary fluctuations of rainfall?—Yes, I think so. I think that it would be safer than the cotton crop.

188. Q. Have you seen the Hansot reclamation scheme?—No.

189. Q. They throw a low bund round a large area of land; the object is to allow the rain water to sweeten the land?—The same practice is followed on tidal creek land further down the coast to exclude sea water. If the sea water at high tides is excluded, the embanked land is gradually sweetened by the rain.

190. Q. We have been told that brackish water is very often usefully used for barley?—And also for wheat.

191. Q. The brackish water grows better crops of barley than are grown by sweet water?—Yes, probably.

192. Q. That crop can stand brackish water?—Slight brackishness does not hurt wheat or barley, but really brackish water is specially useful for tobacco only.

193. Q. A number of questions have been asked as to the number of crops and the number of acres irrigated by a single *kos*. Do you think that a single *kos* would irrigate six acres?—Yes, if the figure applied to successive crops taken in the irrigating season and the water lasts throughout the season. Three crops can be grown in succession on different areas in the alluvial soil of Gujarat: one *kos* will irrigate a greater area of mixed black soil than of *gorad*.

194. Q. Do you think famine labour could be employed to advantage in digging *kachcha* wells?—I would rather give an advance of Rs. 25 or Rs. 30 and let the cultivator do the work himself.

195. Q. Do you not think a good many famine labourers could be employed at this sort of work?—Yes, probably, but not profitably to the cultivator, because they would not do the work in the particular way he wants it done. If done by himself he would arrange the excavated earth to level his field, to make the slope, and generally to prepare the field for irrigation. He would, moreover, dig the well in the position he knows instinctively would be best for his land, and the people he would employ, his relatives and ordinary servants, would be kept off relief works for the time being.

196. Q. Do you think wells constructed by famine labour would be used?—If the occupants of the land dug the wells themselves they would be more likely to be used.

197. Q. With reference to the extension of irrigation by *kachcha* wells in Ahmadabad and Kaira in the famine year, do you think Government would be well advised to make all these *kachcha* wells into *pukka* wells?—Yes, gradually, if the occupants cannot be induced to construct the *pukka* wells themselves.

198. Q. (Mr. Ibbetson).—If the occupants cannot be induced?—The Government should undertake the construction, but the people themselves can do the work cheaper.

199. Q. (Mr. Muir-Mackenzie).—Do you think it would be satisfactory for Government to construct wells?—I should rather see the occupants doing such work themselves.

200. Q. Supposing the work of constructing the wells is not proceeding with sufficient rapidity, then you would have the Government step in?—I would prefer to try all possible means to encourage the people to do the work themselves.

201. Q. Such wells would be uncommonly useful in ordinary seasons?—Yes.

202. Q. There would be considerable extension of irrigated crops?—Yes.

203. Q. You say there was no scarcity of manure for well irrigated crops in the famine year in Gujarat. Had not there been a considerable dry crop area sown and the usual application of manure to that area?—Kharif areas were

sown and manured, but there is also no doubt that the irrigated patches got a full supply of manure.

204. Q. More than usual?—Yes, because more was available.

205. Q. You have not seen much of water-logged areas?—No, except in the central part of Olpad.

206. Q. Could these water-logged areas be made suitable for rice by drawing flood water into tanks and growing rice under these tanks?—Your suggestion is, I think, a very good one, and I should like to see the experiment thoroughly tried.

207. Q. In paragraph 15 of your note you refer to the land being brought under well irrigation since the Revision Survey in the Khed Taluka?—Yes, I saw a number of new wells being constructed and used soon after Revision Survey which was made 10 years ago.

208. Q. Why have they used the wells since the Revision Survey and not before?—They were afraid of enhancement of assessment, especially as regards the well-irrigated areas.

209. Q. They did not know that no enhancement was proposed?—I do not think they did; at any rate they apparently adopted the safe course of waiting in order to see what would happen.

210. Q. Do you think that they understand it now?—I think they do to some extent.

211. Q. Would you prefer permanent exemption of enhancement of assessment on wells or exemption for a term of, say, forty years?—I would prefer permanent exemption in a district well provided with railway and good market communications and where rates are now high.

212. Q. Do you think the cultivator, who was offered exemption for forty years, would be deterred from digging a well by fear of subsequent enhancement?—No, I do not think so. I think he would have a good deal of scope to recoup himself and repay any debt he has incurred.

213. Q. You say that the removal of a foot or so permanently from the deep soil of Broach improves the position for rice beds and does not lower the fertility of the land. I have been told by the people that the washing away of surface soil by drains spoils the eroded areas?—That is quite likely. The weathering effect of sun on the black soil in the hot weather prepares a favourable seed bed. The drains wash away this favourable seed bed with the first fall of rains. Of course the raw soil then exposed is not a favourable seed bed. I propose the removal of surface soil for rice beds once for all and the favourable weathering action goes on annually afterwards.

214. Q. You say there are various reasons why well irrigation cannot be indiscriminately extended; and that it must be restricted to certain areas where suitable sub-soil conditions exist. Would you take no steps to ascertain that beforehand?—I would have a survey and put the work in the hands of a practical man who would do a good deal by eye inspection?

215. Q. Would you like to see the data collected by the Survey Department, especially on points of level and as regards the quality of the water to be made use of?—Such data will help the Surveyor materially.

216. Q. How soon would you begin in a famine year to advance *takavi* for *kachcha* wells?—In September or October.

217. Q. The second-half of September?—Yes.

218. Q. Do you know anything of the experiments conducted by Mr. Tata of Bombay in regard to boring in his Navsari land?—No, I don't, but I do know that borings in several wells in the Surat District resulted in tapping water at a lower level and that the water thus got rose in the wells and increased the supply very considerably.

219. Q. Is it necessary to have expensive tools for that purpose; would the country-made tools not do?—That is a question for an Engineer to answer.

220. Q. What happened in the boring trials which recently were tried at the Surat Farm with country-made tools?—In one well the results were very satisfactory, in another smaller well the trial was unsuccessful. A layer of sand was met with, and it was found impossible to screw the borer through this sand. With better apparatus the trial would probably have been successful. I do not know whether better apparatus could locally be made or not.

221. Q. You had a considerable amount of success with your imperfect apparatus?—Yes, certainly.

222. Q. Do you think it is possible to educate people in the storage of manure particularly in the conserving of

urine?—They do not know much about it now; but if the necessity arose for manuring an irrigated crop, the necessary amount of manure will be forthcoming.

223. Q. They save urine?—To a certain extent, but the floors of cattle sheds are not likely to be generally *pakta* floored and drained, and this is the only way to save all urine.

224. Q. In the famine of 1899 there was a terrible fodder famine and no grass was previously stored; do you think it is advisable to employ famine labour in storing grass?—I suggested that course to the Commissioner, Northern Division, and to the Collector of Ahmadabad, but nothing was done. If the work had been undertaken the grass, which was available in large quantities, could easily have been sold at a profit in Bombay.

225. Q. Is grass stored to any extent anywhere in the Presidency?—Nowhere that I know of except in Bombay and in Military Cantonments and by contractors, and such stacks are often purposely burnt to raise prices.

226. Q. Would the leading of a canal into tracts not altogether favourable for wet irrigation, be of value in sweetening the wells and increasing the amount of water-supply in the wells?—Yes; the water level in the existing wells in the Poona District is much higher than it used to be, but this is an accompaniment to waste of canal water and water-logging on low-lying areas.

227. Q. Have you found that the tanks have the effect of sweetening the water of wells in their vicinity?—I have not observed it.

228. Q. I find you estimate the average yield of the wheat in Ahmadabad to be 1300 lbs. per acre for irrigated land and 560 lbs. from unirrigated?—Yes.

229. Q. Would the irrigated crop get more manure than the unirrigated?—Unirrigated crops get no manure at all practically.

230. Q. It is used more extensively for irrigated than unirrigated crops?—Yes. In Northern Gujarat a well irrigated wheat crop, if well manured, may yield 2,000 to 3,000 lbs per acre of grain, but there is considerable risk of rust.

231. Q. I find that in Ahmednagar we had in—

1895-1896	. 65,000 acres irrigated from wells.
1896-1897	. 126,000 " " "
1897-1900	. 101,000 " " "

Do you think the 101,000 acres would be kept up?—The area will be kept up and extend with a return to years of normal rainfall. In the last four years the rainfall has been deficient. It is certain that as soon as the wells contain a good supply of water the irrigation will increase.

232. Q. In Poona you had in—

1895-1896	. 65,000 acres irrigated from wells.
1896-1897	. 81,000 " " "
1898-1899	. 66,000 " " "
1899-1900	. 57,200 " " "

Notwithstanding that, you hope that an increased area will be maintained?—Yes.

233. Q. Also in Sholapur and Nasik?—Yes.

234. Q. The increase in Poona is slight?—Many of the wells in Poona are probably in the canal area and if there is canal water the people do not use them.

235. Q. Take the canal in Poona. You had—

In 1895-96	. . . 31,000 Acres irrigated.
„ 1896-97	. . . 46,000 „
„ 1897-98	. . . 54,000 „
„ 1899-00	. . . 31,000 „

WITNESS No. 33.—MR. J. A. G. WALES, Acting Collector, Surat.

Answer to Printed Questions.

I.

	Acres.
2. Gross area	1,058,423
Culturable area	715,493
Area protected by tanks.	
Irrigating more than 20 acres	12,454
„ less „ inquiry proceeding.	
„ by Government wells }	7,056
„ by private „ }	

How do you account for that?—It is very difficult to answer that question without fully studying it.

236. Q. Would you prefer small tanks to large for *goradu* soil, or do you refer to black soil only?—Black soil chiefly.

237. Q. Would the present be a very good time for pushing the extension of wells?—No; the people are hard up; they have not yet recovered from the effects of the famine, and I do not think that they have the means to do much themselves. They have no cattle and no money.

238. Q. Do you think that the administration should not be discouraged if their efforts are not successful at once?—Gradual efforts for well extension should be made.

239. Q. Do you think people would be likely to be encouraged if Government advanced money to dig wells and charged a *bagayat* assessment instead of taking back the advance?—When cultivators apply for *takavi* they are not certain that they will get all the money asked for.

240. Q. What do you mean?—They are not sure that the advance will reach them. They are not sure that if Government advanced them Rs. 100 they will get the whole amount. Then they are not sure of getting the money in time.

241. Q. They might apply quickly?—There are objections to taking *takavi*; the people may prefer to pay heavier interest elsewhere if they do not actually get the whole sum from Government. The current belief is that a good deal “sticks” in the hands of the subordinate service.

242. Q. I suggest *bagayat* assessment of Rs. 5 or Rs. 10 per acre as extra assessment for the well, instead of repayment of principal and interest for *takavi*?—I would prefer the payment of interest and refund of advance during a long term of years.

243. Q. Why?—Because in that case the people know precisely where they are, and can calculate definitely whether it will pay them to take the money or not.

244. Q. If you take a single well it would pay so much for area irrigated by one *kos*?—There is speculation about it.

245. Q. Where?—I should prefer interest.

246. Q. Why? I want your reasons.—They might agree to pay *bagayat* rates calculated on actual advance of money by Government if they were certain of getting the whole of the money.

247. Q. They prefer *takavi*?—Yes.

248. Q. Do you think they prefer long instalments?—Yes.

249. Q. More than twenty years?—No.

250. Q. (Mr. Ibbetson).—One more question. Would you tell us whether in the tracts of Gujarat, where there are neither tanks nor wells, the average rice crop is a poor one?—Yes, in the poorer parts, i.e., in the Mehmabad taluka of Kaira district and in the western villages of Ahmadabad it is decidedly poor.

251. Q. Even in those parts where rainfall is more reliable the existence of small tanks would largely increase the average yield?—Unquestionably, if the tanks can give two or three waterings in the season.

252. Q. Could you give us any very rough estimate of the average value of the yield without tanks as against the average with tanks. By what proportion would tanks increase the average yield?—Double, at any rate, in the case of a liberally cultivated crop.

253. Q. It has been suggested to us that it does not increase it by more than 14 to 10. Do you think that estimate is incorrect?—Certainly; manure and two or three waterings at the end of the season would double the outturn in my opinion.

Mr.
J. Mollison.
10 Dec. 01.

There are no private irrigation works, other than wells, and no village works. The soil is black, *gorat* (or *rod*), *besar* (a soil partaking of the qualities of black and *gorat*, composed of rich calcareous mould) and garden soil. The principal crops are *juar* (136,855), cotton (76,196) and rice (79,520); of these rice alone depends on tank irrigation; of minor crops sugarcane is the most important irrigated crop, but this depends principally on private wells. Rainfall, as will appear from the accompanying table, varies considerably throughout the district, ranging from 75 inches in the south to 35 inches in the north.

Mr. J. A. G.
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Wales.
10 Dec. 01.

	Average of twenty years 1881-1900.		Maximum.		Minimum.	
	Ins.	cts.	Ins.	cts.	Ins.	cts.
Chorási Taluka	42	54	In 1894	65 08	In 1899	18 49
Olpád do.	35	30	In 1894	52 90	In 1899	11 22
Bárdoli do.	54	16	In 1894	73 63	In 1899	17 62
Mándvi do.	54	06	In 1883	80 35	In 1899	12 95
Chikbli do.	67	09	In 1883	109 82	In 1899	24 46
Jalálpur do.	62	19	In 1884	82 51	In 1899	24 85
Bulsár do.	66	67	In 1883	90 59	In 1899	36 97
Párdi do.	74	61	In 1882	111 09	In 1899	31 16

There is a demand for tank water, during the south-west monsoon particularly, when the rain ceases too early or there is a very long break. Rice is practically the only crop dependent on tank irrigation; it requires two to three waterings between June and October. The last flooding is most important, because it ensures a good harvest of rice and a second crop of *vál* (large-fruited dolichos). Sugarcane has to be watered three times a month during the hot weather; it takes about eleven months to come to maturity and has to be watered at intervals during all that time (the rains excepted). There is no official control over the distribution of water from irrigation tanks, each man taking the water when he wants it. Irrigation revenue is realised in the form of enhanced assessment.

3. Small tanks in black soil hold water well enough as a rule; masonry core walls are not used in this district, so far as I am aware. Even in case of good and seasonable rainfall there would be a demand for water for rice. The irrigation revenue from tanks is a fixed item, being paid whether water is taken or not. Rice is very commonly grown in black soil and it is for rice cultivation that tank irrigation is resorted to in this district.

4. The existing Government Irrigation Works consist of 702 tanks, of which 287 irrigate each 20 acres and more and 70 Government wells. The normal area under irrigation from the tanks is 12,362 acres and from the wells 1,475 acres. There are no statistics available to determine the range of variation. Neither tanks nor wells are to be depended on in a season of drought, the tanks even in a good year seldom contain water much beyond December and wells run low in a season of drought. The Tápti Canal Scheme and the proposed Uteva and Amba Párdi Tanks have been minuted on by Mr. Beale. I may note that the Olpád branch would traverse part of a water-logged area. Something on a small scale might be done in the way of bunding up the rivers and streams of the district, but the repair of the existing tanks is the most pressing matter.

5. There are no Provincial Irrigation Works.

6. The present irrigation works are all of old standing, dating back probably to the ante-British period; no new works are constructed now-a-days. The old works are repaired as necessity arises and funds permit, by the Public Works Department, who are kept informed of the state of the tanks by the Revenue Department. The number of these works, etc., has been given in paragraph 2. During the last six years less than Rs. 10,000 a year has been spent on the up-keep of irrigation tanks, and of this Rs. 10,000 the rayats contributed nearly Rs. 1,500. Government is supposed to maintain the tanks in efficient order; the *himayat* (water-rate) would only be remitted when a tank is absolutely useless and there is no intention of repairing it. I may quote the following from the despatch of the Secretary of State on the report of the original settlement of Jalálpur (paragraph 4):—"There can be no doubt, as Mr. Flope remarks, of the obligation incurred by Government to maintain the supply of water for lands on which, in consideration of that supply being exceptional, they have imposed an exceptionally high rate of assessment, and it is of the first importance that the Government should not be justly liable to the imputation of a breach of faith with respect to this obligation." I am not in favour of district funds being expended on irrigation works; district funds, as a rule (certainly, it is so in this district), are all required for roads, schools and other legitimate objects of Local Fund expenditures. I am not exaggerating when I say that, so far as my experience goes, not one tank in five is in good condition; I am strongly in favour of devoting more money and greater attention to the up-keep of the existing tanks; the construction of new tanks is desirable, but this can stand over till the old ones are in repair. This district is pretty well off for tanks and the provision of new ones is not an

urgent matter. The villagers often depend on the irrigation tank to supply water for men and cattle, and even if there are tanks and wells for domestic purposes, the irrigation tanks are a useful stand by. Ordinarily the village water-supply is sufficient.

7. The number of *pakka* wells is estimated at 5,726; there are also between 500 and 600 *kachcha* wells. Each well irrigates about 3 acres; the area under irrigation in an ordinary year does not differ appreciably from the area in a year of drought. About 85 new wells have been constructed annually during the last ten years, half by the aid of *takavi* grants. A reduction in the rate of interest, and an extension of the period of recovery would possibly stimulate the construction of new wells; the present period (20 years) seems to me long enough, but the interest (5 per cent.) might be reduced. The water level of the wells has sunk owing to the droughts of 1899-1901, but there has been no wide-spread failure of the water-supply. Some ran dry and were deepened with more or less favourable results. The depth of water below the surface varies from 25 feet in the coast villages of Olpád taluka to 80 feet in some parts of the Bulsár taluka: 35 would probably be the average depth for the district. An irrigation well costs from Rs. 300-500 and protects three acres.

8. Part of the east of Olpád taluka, some 20,000 acres is affected by water-logging and some drainage channels have been cut; others are proposed, but the report on those already made is not favourable. At present remissions are being granted to the extent of Rs. 8,700, and proposals involving remission of Rs. 22,000 are before Government. It would, therefore, pay Government to carry out any works which would reduce the extent of the evil at a reasonable cost.

II.

A.—General.

1. I have served in the Surat District for four years. My personal experience is confined, however, to the talukas of Chorási and Jalálpur.

2. Table * attached.

3. There is no obstacle to the extension of irrigation from any of the causes mentioned.

4. Under the Bombay Land Revenue Code increase in the value of the land due to private improvements is not taken into account in revising the assessment.

5. Loans under the Land Improvement Act have only recently become popular owing to the bad years; the tightness of money during recent years has driven the rayat from the *sávkár* to Government. I am in favour of a reduction of the rate of interest.

6. The state of things contemplated in this question is impossible in this district.

D.—Tanks.

23. The tanks are supplied from the catchment area by natural drainage; the water is distributed by means of earthenware pipes let into the bank, but occasionally the embankment is cut. The supply is maintained till March in a year of ample rainfall; till the beginning of October in a year of scanty rainfall. In a year of drought the tank would never fill. Statistics are being collected to ascertain the area ordinarily irrigated.

24. In this district it is usual to grow rice followed by *vál* (*dolichos lablab*) and *divei* (castor-oil): these are the only crops grown by tank irrigation. In a year of ample rainfall rice requires irrigation to yield a full crop; in a year of scanty rainfall there would be no crop at all without irrigation; in a year of drought there would be no irrigation.

25. If the supply commences too late there will be difficulty in transplanting the seedlings, as they will be too mature to be transplanted; if the supply ceases too early, then the crop will fail, as rice requires its last watering in October, and there will be no chance of a second crop of *vál-divei*.

26. Lands irrigated from tanks are not irrigated also from wells.

28. The irrigation rate is paid in the form of enhancement of land revenue; on an average it is Rs. 4 per acre. It is paid on the whole irrigable area.

29. Little private expenditure is necessary, the cultivator does personally all that is required. In a few cases one or two men are kept through the monsoon to see to the distribution of the water in the rice fields and are paid in

kind (one cart-load of rice) by the people who use the water.

30. There are no maintenance charges; periodical repairs are executed as required and as funds permit. The average amount spent in repairs per acre irrigated is annas 13 pies 4 during the last six years.

31. There are no private tanks in this district.

32. There is no scope for this.

33. The tanks of the district silt up slowly; no statistics of silt accumulation are available. The silt is removed by excavation when necessary.

E.—Wells.

34. Throughout the district, except in parts of Párdi and Mándvi, the average water-level is 35 to 40 feet below the surface of the ground, the water itself being six to ten feet deep. The supply is chiefly from springs: in an ordinary year the wells last out easily and do not run dry in a year of drought. In the part of the district where irrigation wells are used, the water does not ordinarily become saline. A well costs about Rs. 500, and with due attention will last 100 years and more. The water is raised by *kos* (leather bag); the area commanded by a well is the land

within 150 and 200 yards of it; the average area irrigated is 3 acres.

35. As a rule only one crop is taken off land irrigated from wells; in this district it is largely sugarcane or vegetable crops. The crops under wells are irrigated whatever the rainfall may be.

37. The owner of a well pays nothing to Government; a cultivator pays sub-soil water assessment if his land has facilities for water whether he has a well or not.

38. Serious difficulties are not encountered in the selection of a spot for a well, nor in the actual construction. No assistance is given by Government or local bodies.

39. I am not in favour of the construction by Government of wells in land which is private property, at least in this district. The cultivator can build a well considerably cheaper than the Public Works Department, and the takavi system is the only form of Government help required. If the well belonged to Government and the land were thrown up, there would be a dead loss to Government.

40. Temporary wells are not commonly used in this district; a few were made in the famine year, but in black soil they are not feasible, and this district consists principally of black soil.

Mr. J. A. G. Wales.

10 Dec. 01.

1. *Q. (The President)*—You are Acting Collector of Surat?—Yes.

2. *Q.* How long have you held that office?—I have been Acting Collector for the last seven months.

3. *Q.* You were here throughout the famine?—I was not in a famine charge.

4. *Q.* You talk about irrigation by Government wells; what are they?—They were constructed many years ago; I don't think any of them were built in our time.

5. *Q.* How are they managed now?—They are not managed at all; they are there, and if water is taken from them, we charge for that.

6. *Q.* They are all Government wells?—Yes.

6a. *Q.* Have you gone into the Tapti canal scheme?—I have read the papers; but I don't know the country.

7. *Q.* Is there any demand for it; is there any enthusiasm about it among the people?—I don't think the people know about it; I don't think there will be a heavy demand.

8. *Q.* Could you tell us about the Amba Pardi tank? What is the history of the project?—It is a scheme that Government has only just worked out; it is entirely for famine labour. When Government were rather hard pressed, they found that this part of the taluka was the most in want of some relief works, and as the soil is suitable for irrigation, they considered this project favourably.

9. *Q.* Is it suitable for rice irrigation?—I fancy so, there is also some black soil there.

10. *Q.* Has an impetus been given to well construction during the famine?—A most marked impetus.

11. *Q.* You have many applications for takavi advances now?—There is not a great demand; there was a demand in the famine year. I think the demand now is better than it was before the famine.

12. *Q.* In the famine year the demand was largely for *kachcha* wells?—To some extent.

13. *Q.* Do you attach much importance to the extension of well irrigation?—Not as much as to the extension of tank irrigation.

14. *Q.* Do you think there would be much stimulus if takavi advances were given free of interest before a famine?—There would be considerable risk.

15. *Q. (Mr. Ibbetson)*—How?—People would apply who did not really want it; there would be a considerable risk of misapplication of money.

16. *Q.* You think the people would apply who did not need the money?—There would be a strong temptation for people to ask for more than they really wanted; there would be very great difficulty in finding out whether a man who had got Rs. 500 had spent Rs. 500 or Rs. 400.

17. *Q. (The President)*—In the interests of famine protection it is important to increase the number of wells; would it be worth Government's while to forego the interest. Would that have some effect?—I think so.

18. *Q.* Suppose we made another proposal, *i.e.*, give takavi to and have it repaid by increased assessment on the land?—That is in one respect going back to the old system of Government wells which has been abandoned; I think the present system is the best.

19. *Q. (The President)*—Would you allow him to repay money by yearly payments of enhanced assessment?—That would be a permanent assessment on a private well; I think there would be tendency to fight shy of takavi under those conditions.

20. *Q. (Mr. Muir-Mackenzie)*—Do you see any objection to the experiment being tried?—No.

21. *Q.* What number of years do you generally allow for the recovery of takavi?—If it is Rs. 500, I take it in ten years; not more than ten generally.

22. *Q.* The law allows 20 years?—Yes.

23. *Q.* Would it not be a popular measure to allow 20 years?—The rayat would naturally prefer to extend the period of instalments.

24. *Q. (Mr. Ibbetson)*—Would he not have to pay more interest?—There is a tendency to ask for as long a period of instalments as they can get.

25. *Q. (The President)*—You attach more importance to tanks than to wells?—Certainly.

26. *Q. (Mr. Ibbetson)*—Why?—Because one of the principal crops is rice, and they never cultivate rice under wells.

27. *Q. (The President)*—Have you reason to believe that there is room for a large extension of tanks in your district?—In the Jalalpur Taluka, with which I am best acquainted, I do not think there is. There are quite as many tanks as are required.

28. *Q.* Do you consider that not one tank is in good condition?—Nearly so.

29. *Q.* I would gather from the tenor of your note that you consider that the first step to be taken to prepare the district against famine is to put the tanks in order?—Yes; and then make new tanks if you like.

30. *Q.* What is the extent of irrigation from tanks?—Tanks of less than 20 acres irrigate 8,000 acres, of more than 20 acres, 13,000 acres or 21,000 acres in all.

31. *Q.* If the tanks are put into proper order, you would probably increase this area?—Yes, considerably; but it would still be small in proportion to the cultivable area.

32. *Q.* What measures would you adopt for the provision of fodder at the time of famine?—From my experience of the last famine, I think, there would be little difficulty in this district, as the amount of land under grass is considerable, and there are forests close by.

33. *Q.* You think that famine labour could be better employed in clearing tanks than road-making?—Yes, there would be a large return to Government.

34. *Q. (Mr. Ibbetson)*—Would there be a return to Government if the tanks were cleared?—Yes, there will be an increased amount of assessment.

Mr. J. A. G.
Wales.

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35. Q. Would there not be an increased assessment on the additional area cultivated after clearing out the tanks?—Yes.

36. Q. Where wet assessment was paid where there was no water it has now been taken off?—I do not know.

37. Q. Are you of opinion that land which was assessed wet and does not now get water should cease to pay the assessment?—Yes.

38. Q. If you improve the water-supply, is Government entitled to impose more assessment?—Yes.

39. Q. You say you are not in favour of District Funds being expended on irrigation works?—Yes.

40. Q. There are a number of small tanks; suppose Government were to assign the revenue to the District Boards, do you think they would manage these small tanks and keep them in repair?—No, the District Board would not be a good agency; besides the revenue derived from these tanks goes to the expenses of the additional establishment required to maintain them.

41. Q. Do you think the people could maintain the tanks?—Yes, they could do it in some villages.

42. Q. You cannot work through Patels?—No, excepting some very good Patels.

43. Q. Why?—In some villages there are rival parties, and they would never work harmoniously.

44. Q. You say a report was made against the drainage channel in the Olpad Taluka; what was the complaint?—The people complained about the scouring of the surface of the soil, and an officer was deputed to make inquiries.

45. Q. He came to the conclusion that the complaint of the people was justified?—Yes, it was well founded.

46. Q. I understand there has been no famine in your district for 63 years?—That is not quite correct; there was famine to a considerable extent in the Maudvi Taluka; there was famine also in Olpad and in the south of the district.

47. Q. Was it severe?—Very severe in Mandvi.

48. Q. Not elsewhere?—I do not know, I am speaking from what I have read.

49. Q. Have you got records of previous famines in this district?—Not for the last 60 or 70 years, during which there was no famine; there was only scarcity. Surat has always been free from famine till the last three years.

50. Q. Under these circumstances, would you spend money on protecting Surat?—No.

51. Q. You could not tell how many wells were dug in that part of Surat where there was famine?—I could not.

52. Q. (Mr. Rajaratna Mdlr.)—You say the District Boards will not be able to manage the tanks, and that the people would not be willing to help them. Would you like to transfer the management to the Revenue Department? Do you know whether the Revenue Department would be able to undertake the repairs, if funds were forthcoming—somebody must repair them?—I do not see what agency could be employed.

53. Q. In the Madras Presidency, tank irrigation is under the management of the Revenue Officers?—We too should have a special establishment for that purpose.

54. Q. In that case the Revenue Department would be able to undertake the management of this work?—Certainly.

55. Q. You object to the Public Works Department carrying out this work?—Yes, because it is not worth the cost.

56. Q. In paragraph 4 you say "the normal area under irrigation from tanks is 12,362 acres and from wells 1,475 acres."—These are old figures; they are not to be absolutely depended upon.

57. Q. Do you not measure the area every year?—Not actually.

58. Q. Was any remission granted on wet lands during the last famine, under tanks which ran dry?—Not specially on wet lands; if a man had not the means to pay the assessment he received remission whether his lands were wet or dry.

59. Q. Is there any reason to believe that the probability of the land assessment being liable to be enhanced at the next revision of settlement, prevents the people from digging wells?—I doubt it; I have never heard of it until I heard it in evidence here.

60. Q. In paragraph 37 you say "the owner of a well pays nothing to Government; a cultivator pays sub-soil water assessment, if his land has facilities for water, whether he has a well or not." Does the sub-soil rate vary in different localities?—I do not know what the sub-soil rates are. They vary with the character of the sub-soil.

61. Q. (Mr. Muir-Mackenzie)—I understand you to say that the area under rice which receives assistance from tanks is probably about 23,000 acres?—Yes.

62. Q. The total area of rice in normal years is 106,000 acres?—I make it 80,000; it fluctuates.

63. Q. I have got 106,100, from the agricultural statistics of the Government of India. Supposing it to be 80,000, do you think it would be advisable to have tanks constructed in order to possibly improve, or at any rate guard, against a fluctuation of the water-supply of the remaining 60,000 acres?—Yes.

64. Q. Do you think there are many sites for these tanks?—I do not think there are many sites.

65. Q. Would tanks be no good along the sea coast?—I do not think so, I doubt it.

66. Q. Suppose, for the sake of argument, that the excess of what is called untanked rice over tanked rice is very considerable in the Chikhli Taluka, don't you think it might be likely to find sites in that taluka?—I know very little of Chikhli Taluka, but you might make tanks there as it is a hilly country.

67. Q. In paragraph 8 of your memorandum you say "at present remissions are being granted to the extent of Rs. 81,700, and proposals involving remission of Rs. 22,000 are before Government." That means that, if we could remedy this water-logged condition, we might possibly get back that amount of revenue; it would be worth while to spend a good deal for that?—Yes.

68. Q. Have you seen any of the drains?—Yes.

69. Q. Have you noticed any sign of their bad effects? No.

70. Q. Do you know anything of the proposed reclamation schemes?—Yes; I have seen one.

71. Q. Is that the reclamation of the tidal area?—Yes.

72. Q. You don't know of any reclamation to cure salt apart from shutting out tide?—No.

WITNESS No. 34.—BHIKHUBHAI AKHUBHAI, Bulhar Taluka.

Answers to printed questions.

Mr.
Bhikhubhai
Akhubhai.

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I am now 55 years of age, and I am engaged in agriculture for all my life.

3. (1) No.

(2) Cattle not sufficient; more required.

(3) Manure, as at present obtained, will be insufficient.

(4) The land consists of black, gorat, dadri (stony). Black soil is not much suited to irrigation.

(5) Yes. It will be a bar if the supply is uncertain, etc.

(6) Yes. Lack of capital; there can be found one or more cultivators in each village to undertake cultivation by irrigation.

(7) No.

(8) None.

(9) None.

4. I constructed a new tank, area one acre, last year, which irrigates merely four acres, but at the revision survey my jarayat land has been assessed to *kiari* land. It was thus not exempted from enhancement.

The assessment of my jarayat land, which was Rs. 1-8-0 per acre, has been raised to Rs. 4-0-0.

No.

If Government agree not to enhance assessment, say, for a period of 100 years, people will be induced to use private capital.

5. No one takes takavi for such purposes, as irrigation on an extensive scale is not in existence in this district.

It should be publicly announced to the villagers that takavi can be got for irrigation.

(1) Yes.

(2) Yes.

(3) Yes.

(4) Yes.

(5) Yes.

(6) Yes.

6. No. A few persons may be induced to seek the irrigated areas.

Yes. People have strong desire to extend irrigation.

D.—Tanks.

23. (1) Natural, by rain water from adjacent lands.

(2) In low-lying lands by wood *supdas* or by *kos*.

(3) (a) April to May.

(b) November.

(c) July or August.

(4) It depends on the nature of the soil. To irrigate one acre of land from June to November the area of the tank should be three acres.

24. (2) It depends upon the nature of the crop. Say, if sugarcane is grown the value of the produce will increase by Rs. 50 per acre.

(3) (a) One acre will produce 200 maunds of molasses.

(b) Fifty maunds per acre.

(c) Nil.

26. Yes. When the tank water fails, as the crop will fail but for the well water.

27. Cannot say, as there is no proper irrigation.

28. None exists.

29. It depends upon the distance that water is situated.

It will be from Rs. 25 to Rs. 30 for the season.

30. A few tanks which irrigate more than 20 acres are repaired at the expense of the State, the villagers contribute 10 per cent. of the expenses. No arrangement is made to clear silt nor any watch kept.

31. None exist.

32. Yes. Government should give land free and advance money as takavi without interest.

33. Yes. Cannot say, but it may be about five feet within five years. It depends on the nature of the soil.

No dredging or other contrivance is adopted. I would propose that some arrangement should be made to fill up tanks. I believe there are rules in the Public Works Department to provide water to tanks. Some arrangement should be made by which more water can be carried to the tanks.

34. (1) From 45 to 60 feet.

(2) By springs and by percolation.

(a) Yes.

(b) Yes.

(3) Rs. 500 to Rs. 600.

(4) Up to 100 years if sweet, or else 25 years.

(5) By *kos*.

(7) From three to four acres, and much depends upon the depth of the water.

35. (1) 1½.

(2) None.

(3) (a) One hundred per cent.

(b) Fifty do.

(c) Nil.

37. (1) For *bagayet* double.

(2) Less than double on the area of land actually irrigated.

38. (1) No.

(2) Yes, a little.

None.

Yes.

39. No. If Government can give a well free of cost, Government will like to give water to others as the well would belong to them, and this is objectionable.

40. Very seldom. To a great extent. If Government can give money. Also at the revision the assessment was not raised on account of *kachcha* wells.

The takavi should be given at once. There is a great delay which takes out much of the advantages.

There are small rivers in the taluka which, if bunded, will benefit the cultivators greatly. There is a spring near the Parnera which, if bunded, will benefit many villages.

Artesian wells should be encouraged.

1. Q. (The President through an Interpreter)—What land do you possess?—Eighty acres.

2. Q. What is the land used for?—For cultivation of vegetables and chillies.

3. Q. From wells?—From wells and tanks.

4. Q. Have you got rice also?—Yes, 20 acres.

5. Q. Is all that 20 acres rice?—Yes; of the rest some is uncultivated and some cultivated; a portion is reserved for grass.

6. Q. Did you find the grass useful for the cattle during the last year of drought?—Yes, I was able to keep my cattle alive.

7. Q. Did the cattle die much in your taluka?—Yes, in large numbers.

8. Q. How many wells have you got?—Two.

9. Q. In every village there is an increase in well irrigation?—Yes.

10. Q. They build wells from takavi advances?—Yes, from takavi grants and also from their own resources.

11. Q. The manure at present obtainable is insufficient for a large increase in the area cultivated?—Yes.

12. Q. Where do you get your manure from; from cattle?—Yes; I have got sufficient cattle.

13. Q. Do you know anything about such manure as oil cake?—We want money; owing to the want of money we cannot purchase expensive kinds of manure.

14. Q. In answer to question 6 you say "people have a strong desire to extend irrigation?"—During famine people had no water and they now realise that irrigation would be a great boon.

15. Q. How do they show their "strong desire;" by taking takavi advances?—Yes.

16. Q. But you say only few takavi advances are taken where there is the strong desire?—People are afraid of taking takavi.

17. Q. Why?—If a man is not able to repay the Government instalments when they fall due, the whole debt is collected from him at once.

18. Q. Has that ever happened?—It is said that measures will be taken to recover the amount at once. I know of no specific instances.

19. Q. You say "the takavi should be given at once. There is great delay which takes out much of the advantages." What are these delays?—If our applications for takavi are granted we get the money after six months.

20. Q. Why so long as that?—Inquiries are made through talukas and villages by the Mamlatdar; he submits his report to the taluka officer who refers the matter to the Collector; and so the cultivator who applies for takavi does not get it in time.

21. Q. (Mr. Jebbetson)—You say that your land assessment was raised from Rs. 1-8 to Rs. 4 in the revision of settlement; have you improved your land; why was it raised?—Because I made new *kiari* land. I converted dry crop lands into rice lands. If I make a tank at the next revision of settlement that tank will be charged for.

22. Q. Do you know that according to law you cannot be charged on the tank?—There is a village near Lalpura in the Bulsur Taluka where on land under a tank Government have levied water assessment to save the land adjoining it.

Mr.
Bhikhubhai
Akhubhai.

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Mr.
Bhikkubhai
Akhubhai.

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23. Q. You say at the original settlement the assessment was not raised on *kachcha* wells; was it raised on *pakka* wells?—A sub-soil rate was charged.

24. Q. It is charged on *kachcha* wells also?—Yes; the assessment was raised on lands in which there was a well as well as on other lands which adjoined to it owing to the sub-soil water.

25. Q. Do you mean to say that if a man makes a well he gets his own assessment raised and also that of his neighbours?—Yes, if he has a well in his land, on the land adjoining to his land, within 80 chains of his well, the water rate is levied.

26. Q. Suppose there had been no well, would the sub-soil rate have been charged?—Yes.

27. Q. You say you would like Government to make a well in your land free of cost because the well would belong to you. Suppose Government gave the well to you and then levied a wet assessment, what would you say to that?—I would not like that.

28. Q. Why?—Because the assessment would be raised permanently.

29. Q. (Mr. Rajaratna Mdlr.)—You referred to a tank; was it constructed in your own land or in Government land?—In my own private land.

30. Q. Did you apply for permission to construct the tank?—No.

31. Q. What crops do you grow on the land irrigated by the tank?—First I sow rice; afterwards either sugarcane or chillies or brinjals if there is sufficient water.

32. Q. Do you irrigate the rice crop also?—Yes; when there is no rain I utilize water from that tank to irrigate rice.

33. Q. Have you an embankment along the rice lands?—Yes.

34. Q. When were your wells dug?—In 1871.

35. Q. After the original settlement?—Yes.

36. Q. How many acres can you irrigate from your two wells?—One or two acres.

37. Q. What assessment did you pay on these lands before the Revision of Settlement?—Rs. 1 per acre.

38. Q. What was the assessment at the Revision?—Rs. 4 per acre.

39. Q. It was raised from Rs. 1 to Rs. 4?—Yes.

40. Q. You have got a tank as well as wells situated in the same field?—Yes.

41. Q. The land irrigated by wells can also be irrigated by the tank?—Yes; water in the wells was not sufficient this year so I irrigated from the tank.

42. Q. Under the Revision of Settlement the assessment was raised from Re. 1-8 to Rs. 4?—Yes.

43. Q. (Mr. Muir-Mackenzie)—Do you know anything about selling grass in Bombay?—I do not sell grass; what I have I reserve for my cattle.

44. Q. Did you grow any crops from your wells in the famine year of 1899?—No.

45. Q. You did not use your well at all?—No, because there was very little fodder and if I had used my cattle they would have died.

46. Q. These two wells were dug out of your own money?—One was dug out of my own money, and I got the other well with the field which I purchased.

47. Q. Purchased out of your own money, or did you borrow the money?—My own money.

48. Q. If you want to borrow money to make a well what rate of interest have you to pay to the *bania*?—Six per cent.

49. Q. Would you like to see more tanks made in your taluka by Government for rice?—It would be very beneficial; there is special necessity for more tanks.

50. Q. There are many places in which tanks could be made?—All the land belongs to Government; if Government wish to dig a tank they can acquire the land. There are plenty of sites.

51. Q. Do you know many other people besides yourself who have dug tanks of their own?—If people were not afraid of Government raising the assessment they would build many more tanks.

52. Q. You say you pay Rs. 4 on these new *kiari* lands; what was the rate on the old rice lands?—Rs. 12 or 13 per acre.

53. Q. On old *kiari* lands?—Yes.

54. Q. You now pay Rs. 4?—Yes; my land was *jara-gat*.

55. Q. On new *kiari* land you pay very much less than on the old *kiari*?—It is less than the old *kiari* rate but the land is poor.

WITNESS No. 35.—KHAN SAEED D. DHUNJIBHOY BILIMORIA, Mamlatdar, Ankleshwar.

Answers to printed questions.

D. Dhunjibhoy.

10 Dec. 01.

1. The subjoined statement gives information about culturable and irrigable area, etc., in 1900-1901.

Gross area.	Culturable area.	AREA PROTECTED BY		
		Government irrigation works.	Tanks.	Wells.
85,747—32	76,952—8	...	1898—1899.	
			67	302—54
			1899—1900	
		...	...	696—32
		...	1900-1901	
		...	1—11	154—29

Character of the soil.

1. Panod.
2. Chorasi.
3. Divi.
4. Diva Rajput Party.
5. Diva Bohra Party.
6. Survadi.
7. Samore.
8. Chhapra.
9. Bajod.
10. Pungam.
11. Haripara.
12. Ankleshwar.
13. Maudwa Bazar.
14. Sarangpur.
15. Andada.

The bulk of the land consists of black soil, but in the marginally-noted villages, there is a very large area of Gorudu land which is suitable for producing irrigated crops.

In the black soil cotton, juar and til are largely grown.

The principal crops grown are juar, cotton and til. They do not require irrigation except in years of drought or scanty rainfall. Rice is also grown in this taluka which require to be irrigated, but the *Kiari* land is dependent on tanks, the water of which is sufficient in years of ordinary rainfall.

In some places wheat and gram are grown when there is sufficient moisture in the land and so the crops do not require to be irrigated in ordinary years.

The rainfall during the last 11 years in the taluka is given in the accompanying statement. It seems that in this taluka there is in some years demand for water during south-west monsoon.

The crops in this taluka are irrigated from tanks and wells. The crops irrigated from tanks is chiefly rice.

The crops irrigated from wells are sugarcane, ginger, onion, wheat, and other vegetables. Irrigated crops from wells are raised in the 15 villages mentioned above. In the other villages there is hardly any well used for irrigation purposes.

Only those fields which are assessed to tank water assessment are privileged to take water from the tank and the tank water assessment is consolidated with the assessment of the soil.

At the time of the introduction of the present survey a special water-rate was assessed on land liable to be irrigated from wells, and all land so assessed can take water from the well. This well water assessment is also consolidated with the assessment of the soil. In the revision survey this well water assessment will be abolished and all land, whether headed by wells or not, is to be assessed with sub-soil water assessment.

3. If in black cotton soil tanks be excavated, till yellow earth is reached, they can hold water. If such tanks be

constructed they can be of no use unless the Jarayat land surrounding it be converted into Kiari land.

Kiari land surrounding tanks is the only land irrigated in villages having black soil and in years of fair or good rainfall, there is no falling off in the area irrigated and the revenue is not precarious because people have to pay the water assessment whether they take water or not.

Owners of black soil desire to have more tanks, as they can convert Jarayat land surrounding new tanks into Kiaries, and such tanks if constructed are expected to be as remunerative and as important as the tanks now in existence.

4. * * * * *

5. * * * * *

6. All tanks are in existence from time immemorial. They are controlled by Government. In this taluká there are in all 110 tanks which pay irrigation revenue, the area assessed being 940 acres and 26 gunthas.

As Government have assessed a water-rate on a certain number of fields, it is their duty to see that the tanks are maintained and repaired to such an extent that all fields assessed under them can obtain water.

Excluding expenditure on relief works during late famines it is said that Government hardly incur any annual expenditure on such tanks.

Except during the last two years hardly any remission seems to have been given in other years of scanty rainfall. No new works of this class have been constructed of late years. District Local Boards or private owners have not undertaken such works. It is not desirable that District funds should be expended on such works. It has not been the practice for Government to encourage the construction of such works by loans to District Boards or to land-owners. The protective value of these works can be increased by devoting more money and greater attention to their up-keep. These works are also very useful as they supply water for men and cattle.

7. In paragraph 2 has been given the total area irrigated by wells in ordinary years (1898-99 and 1900-1901) and in the year of drought (1899-1900). The number of new wells constructed annually during the last 10 years is as follows :—

Year.	Number of new wells constructed.
1891-92 . . .	3
1892-93 . . .	5
1893-94 } . . .	3
1894-95 } . . .	
1895-96 . . .	2
1896-97 } . . .	11
1897-98 } . . .	
1898-99 } . . .	
1899-1900 . . .	15
1900-1901 . . .	...

The following table gives information about advances made by Government for the construction of wells during the last 10 years :

Year.	N. of persons to whom advances were made.	Total amount advanced.
1891-92 . . .	1	Rs. 250
1892-93 . . .	...	...
1893-94 . . .	...	...
1894-95 . . .	...	...
1895-96 . . .	2	1,875
1896-97 . . .	...	...
1897-98 . . .	...	...
1898-99 . . .	...	...
1899-1900 . . .	1	500
1900-1901 . . .	...	...

D. Dhunji-bhoy.
10 Dec. 01.

Except in the 15 villages mentioned above, it is not possible or desirable to stimulate the construction of new wells by more liberal advances or inducements for the following reasons—

- (1) Wells are required to be dug very deep.
- (2) The water obtained is often salt or turns out salt after some years.
- (3) Frequently a stratum of earth called Kohadu intervenes which it is very difficult to dig out.
- (4) The wells do not last for a long time.
- (5) The water-supply is not sufficient.
- (6) Much of the water is wasted as the land irrigated cracks.
- (7) Anyhow the people do not desire to construct wells in the villages of black soil as the product of the irrigated crop is inadequate to the cost involved.

Almost all the wells for irrigation purposes are situated in the 15 villages mentioned above, and although people have constructed new wells in these villages recently, they have not borrowed money from Government. Most of the wells had to be deepened owing to the recent droughts, and as the rainfall in 1900-1901 was scanty the supply of water in the wells is still deficient.

No well is said to have fallen into disuse owing to the droughts.

In the Goradu villages the total average depth of the wells is 35 to 40 feet and 50 to 55 feet in villages having black soil. The average cost of construction is Rs. 600 in villages of Goradu land. In villages of black soil a very few wells were constructed but they fell into disuse very soon.

In this taluka almost all wells have one kos and the average area attached to and commanded by a well is 7 acres, and the average area irrigated by a well in anyone year is 4 acres.

1. Panod.
2. Chhapra.
3. Ankleshwar.
4. Umarwadá.
5. Aloni.
6. Sasipura.
7. Karmali.
8. Bavidra.
9. Pilludra.
10. Pardi Idria.
11. Sisodra.
12. Adudra.
13. Sarthau.
14. Kanva.
15. Nagal.
16. Sajod.
17. Mandua Matted.
18. Divi.

8. In the villages noted in the margin lands are water-logged, and therefore additional drainage works are required at Government cost. If suitable drainage works be provided and repaired occasionally, waste land is likely to be taken up for cultivation and the revenue of the water-logged occupied land would be assured.

9. Relief labour was employed on the excavation of tanks and kachcha roads and collecting stone metal.

Some of the kachcha roads undertaken were left uncompleted. Village tanks excavated contain more water than usual and have thus proved beneficial to the people for watering cattle as well as for irrigating Kiari lands.

II

A.—General.

1. The answers below refer to Ankleshwar Salooka of the Broach District. I have been serving as Mamlatdar of this taluka for the last 11 months.

2. The average rainfall in each month of the year has been given at the end of the accompanying statement.

3. (1) and (2) for the reasons given in paragraph 7, G. R. No. 2275, I am not in favour of constructing more wells in the black soil villages. If water can be obtained by flow

from tanks and canals a very large area of land can be irrigated with the present population and the present stock of bullocks.

(3) In large towns, most of the non-agriculturists have cattle for domestic purposes, and the people of neighbouring villages can thus obtain a supply of manure from towns in addition to their own. It is said that if hemp be sown and the plants cut down and scattered on the land after some days, it would supply sufficient manure. Again, land sown with til does not require to be manured next

D. Dhunji-bhoy. year. Again, people can purchase castor-oil cakes which is used as manure.

10 Dec. 01. (4) The bulk of the land in this taluka is black cotton soil, and it is said that it is not unsuitable to irrigation, for, besides the crops of jwar, cotton and til, other irrigated crops can be raised on such land.

(5) If canals of continuous flow be constructed (if feasible) leading from the rivers Nerbudda, Tapti and Kim, there will be no obstacle to the extension of irrigation by these means.

(6) Cultivation of irrigated crops is costly, but if advances be made for a few years, people will be able to continue such cultivation with their own means.

(7) People do not anticipate that there will be any perceptible increase in the assessment, or in rent by the extension of irrigation, beyond the water-rate they will have to pay.

(8) There is no uncertainty of tenure as regards Government land, and cultivators, though they mortgage their land to *Sowkars*, cultivate it themselves. Again, *Sowkars* are now parting with the land in their possession.

4. Land irrigated from works constructed by private capital are exempted from enhancement of assessment on account of the irrigation.

No tenant in this taluka has constructed any irrigation work in his holding.

5. Loans under the Land Improvement Loans Act are not freely taken by the people as will be seen from paragraph 7, G. R. No. 2275. For the reasons given in the same paragraph, I do not propose to give takavi for wells in the black soil villages. In the 15 villages mentioned in paragraph 2, G. R. No. 2275, all the wells are situated, and the people of these villages do not borrow money from Government for that purpose.

6. Except tanks and wells in the 15 villages near the river Nerbudda, there are no irrigation works in this taluka. I therefore cannot say whether the extension of irrigation tends to injure the remaining cultivation by attracting its cultivators to the irrigated tracts.

People of this taluka have evinced their desire to have firstly, canals, and secondly, tanks.

D.—Tanks

23.

(1) The tanks in this taluka are supplied with rain water.

(2) Only that land which is assessed to tank water assessment is privileged to take water from the tank. In big tanks pipes are laid for taking water, which can be obtained by flow, as long as the level of water is above the pipe. Again, water can be taken by removing earth from the banks and repairing the breakages at the expense of the person thus taking water. But if water be very low, as is the case in years of scanty rainfall, it can only be obtained by lift, which process is both expensive and laborious.

(3)

(a) In a year of ample rainfall water is sufficient for the monsoon crop, and another irrigated crop can also be raised in the same land even without water.

(b) In a year of scanty rainfall the water hardly suffices for all the land assessed under the tank, and if there be no late rain, no irrigated crop can be raised.

(c) In a year of drought, the water does not suffice for the ordinary monsoon crop, *viz.*, rice, but owners of some of the neighbouring fields can utilize the water available for growing crops of jwar, bajri, etc., or fodder crops.

(4) The area ordinarily irrigated from a tank depends upon the size of the tank, the quantity of water available and the degree of facility offered for taking water such as lift or flow.

24. * * * * *

25. * * * * *

26. In this taluka there is hardly any well in or near the land assessed under the tank.

27. * * * * *

28. * * * * *

(1) In this taluka, all tanks belong to Government, and the average water-rate levied by Government annually is Rs. 4 per acre.

(2) I do not think that the cultivator of land assessed with tank water assessment has to pay more rent.

(3) No more, beyond the water-rate mentioned in paragraph (1) is to be paid to Government.

The rate is paid on the total area of land assessed to tank water assessment.

29. The expenditure for bringing water to the field varies with the distance of the field from the tank. It also depends on the way in which water is taken, that is, by lift or flow.

The expenditure is generally incurred by the person who cultivates the land, and he is bound to pay rent to the owner of the land, whether he receives water from the tank or not.

30. As regards watching no establishment is required. Irrigation tanks have been occasionally repaired, and silt has been removed, from Local funds or Provincial revenue, but not completely and not to the satisfaction of the people.

The approximate annual cost per acre irrigated varies from Rs. 25 to Rs. 30 including the price of manure.

At present tanks are not repaired to the extent to which they may hold as much water as may be required for irrigating all the fields assessed under them, and so some arrangement should be made to repair them occasionally, in order that all fields assessed under them can obtain water.

31. In this taluka there is no tank constructed by a private person or persons.

32. I do not consider it advisable to encourage and assist the construction by private persons of further tanks.

33. Tanks are liable to silt up, and therefore do not contain the quantity of water required in all the fields assessed under it. Some tanks have silted up so much so that they retain hardly any water. The silt is removed by excavation. Hitherto proper care does not seem to have been taken to prevent the silting up of tanks.

E.—Wells.

34.

(1) *Vide* paragraph 7, G. R. No. 2275.

(2) Almost all wells in this taluka are in the 15 villages of Goradu land. They obtain water from springs, but water drains with it a large quantity of sand, and it is therefore necessary to clean these wells very often. These wells are not liable to fail or to become too saline to use in ordinary years or in years of drought.

(3) *Vide* paragraph 7, G. R. No. 2275.

(4) The average duration of a well depends upon the occasional repairs. If the wells be repaired frequently they may last for many years, at least up to 100 years.

(5) Water from wells in this taluka is usually raised by water lifts* made of skin drawn by bullocks.

* (Kos.)

(6) and (7) *Vide* paragraph 7, G. R. No. 2275.

35. * * * * *

36. * * * * *

37. At the time of the old settlement, the irrigation capacity of each well was tested, and an area of land headed by the well, varying with the size of, and the quantity of water in, the well, was assessed to the well water assessment.

All land assessed under the well, whether water be taken or not, has to pay a water assessment of Rs. 3 per acre to Government.

If an acre of land with a well be rented, the rent to be paid is about Rs. 3 more on account of the well water (*vide* paragraphs 2 and 7, G. R. No. 2275).

38. In black soil, people seldom dig wells, and in Goradu land serious difficulties are not to be encountered in the selection of the spot and in the actual construction of the well (*vide* paragraph 7, G. R. No. 2275).

39. Except in the 15 villages near the river Nerbudda, wells if constructed in other villages are not remunerative. I am therefore not in favour of constructing wells by Government in private property.

40. For the reasons stated in paragraph 7, G. R. No. 2275, temporary wells are not commonly used in this taluka, and it is therefore not necessary to encourage their construction in a year of scanty rainfall.

Statement of Rainfall.

D. Dhunji-
bhoj.

10 Dec. 61.

YEAR.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	TOTAL.
						In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.
1891	...	...	...	...	...	4 77½	37 88½	8 52	10 30	0 11	...	...	61 59
1892	...	...	...	...	...	4 89	11 63	10 41	10 15	1 0	...	...	39 8
1893	...	0 11	...	0 4	0 22	27 84	6 16	7 82	1 64	...	0 88	...	44 31
1894	0 10	...	0 1	...	...	12 21	22 19	4 20	11 5	0 47	...	...	59 23
1895	...	...	...	...	...	4 80	12 23	6 97	3 24	1 75	...	...	29 5
1896	...	...	...	...	...	7 75	42 70	4 92	2 78	...	0 25	...	58 40
1897	...	...	...	...	...	1 31	18 49	10 82	5 61	2 39	...	...	38 81
1898	...	1 45	...	...	0 5	10 20	18 22	2 36	6 68	...	...	0 10	39 6
1899	...	...	...	...	...	10 63	0 45	0 79	0 21	...	...	...	12 28
1900	...	...	...	...	...	...	6 67	18 51	7 56	...	...	...	32 94
1901	0 8	...	0 1	...	...	0 18	15 39	4 51	0 59	0 39	...	...	21 15
Total	0 18	1 60	0 2	0 4	0 27	84 34½	192 20½	70 83	60 1	15 11	1 23	0 10	434 90
AVERAGE	0 16	0 14	0 2	0 3	0 2	7 66	17 47	7 26	5 45	1 37	0 11	0 1	39 54

1. Q. (The President).—You are Mamlatdar of Ankleshwar?—Yes.

2. Q. How long have you held that office?—For the last 11 months.

3. Q. Where were you before that?—In the Panch Mahals in the Kalol Taluka.

4. Q. Have you been in Gujarát all through your service?—Yes.

5. Q. Were you in the Panch Mahals District during the famine?—Yes.

6. Q. Was the famine very bad where you were?—It was not so keen in Kalol where I was, as it was in other parts of the Panch Mahals.

7. Q. You say that "the crops irrigated from wells are sugarcane, ginger, wheat and vegetables; irrigated crops from wells are raised in the 15 villages mentioned above. In the other villages there are hardly any wells used for irrigation purposes." What is the reason for that?—Because it is black cotton soil. I have given my reasons in another paragraph. Wells have to be dug very deep. Sometimes a stratum of earth called *Khadu* is struck which is very difficult to dig. The water supply is very deficient.

8. Q. You say "any how the people do not desire to construct wells in the villages of black soil as the produce of the irrigated crops is inadequate to the cost involved"?—Yes; they do not pay.

9. Q. Are there not plenty of wells excepting Government wells in the other talukas?—In Surat and Bulsar there is no black cotton soil and there are plenty of wells. In Ankleshwar taluka they are situated in 15 villages only.

10. Q. You go on to say "The expenditure is generally incurred by the person who cultivates the land and he is bound to pay rent to the owner of the land whether he receives water or not"?—Yes; it is not equitable that others should take this water; because these people have to pay assessment whether they take it or not.

11. Q. How many wells have you in your taluka?—246.

12. Q. In the 15 villages?—Yes, there are only 4 or 5 in the others.

13. Q. Then you have got nearly 20 wells in each village?—In one village there are about 50 wells.

14. Q. I gather there are enough of wells for the villages?—Yes; the people there are better off than other people; they don't even borrow money for constructing wells.

15. Q. You say people in black cotton soil want to have more tanks?—Yes, they desire to have more tanks.

16. Q. You have altogether 110 tanks in the taluka?—Yes.

17. Q. How much do they irrigate?—940 acres.

18. Q. Are there sites for more tanks?—I have not studied that question. I do not know of any.

19. Q. Are these tanks generally very shallow?—Yes, they are silting up.

20. Q. When they are filled in the monsoon, how long do they last before they become empty?—They last up to March if they are properly filled.

21. Q. You say in paragraph 8 "In the villages noted in the margin lands are water-logged and therefore additional drainage works are required at Government cost"?—Some drainage works do exist.

22. Q. Are they working well?—No, I do not think they have done any good since they were made some years ago.

23. Q. Are they very old?—No; they were constructed recently.

24. Q. Do people object to the drains?—The people are divided in their opinion; some object to have more drains because, they say, the surface soil is washed away; other people whose lands are further off are desirous of having more drains.

25. Q. I suppose Government is remitting the revenue on those lands which are water-logged?—Yes, during the last two years they have done so.

26. Q. Are there any places where it might be possible to make large tanks to store water?—No, I have not heard of any.

27. Q. You say "It is said that if hemp be sown and scattered on the land after some days it will supply sufficient manure." Do the people use oilcake largely for manure?—Those who are accustomed to irrigate their lands use it, but it is not largely used.

28. Q. It is not used where there is no irrigation?—No; only those persons who irrigate their lands use it.

29. Q. They all know of it?—No; not all classes; because people, like, the *kolis*, are not accustomed to irrigation; they simply depend upon monsoon crops.

30. Q. Do you think it would be a good thing if famine relief labour was turned out to clean these village tanks?—It would supply sufficient labour.

31. Q. (Mr. Rajaratna Mdlr.)—How many wells have been constructed during the last five years?—In the famine year only one well was constructed.

32. Q. The others are all old wells?—Yes.

33. Q. Are there facilities for constructing more wells?—No; the bulk of the land consists of black cotton soil and I would not recommend that wells should be constructed because they will not pay.

WITNESS No. 36.—MR. NARBHERAM MUNCHARAM, formerly Mamlatdar of Olpad.

Mr. Narbheram Olpad P.—Yes.

10 Dec. 01. 2. Q. Do you know the Taluka thoroughly?—Yes.

3. Q. Have you ever seen a drain?—Yes, I saw one in the monsoon of 1900.

4. Q. It was a short monsoon?—Yes.

5. Q. The drain was empty?—Yes.

6. Q. Could you tell me whether the people in the neighbourhood were satisfied with the working of the drain?—Yes, the only people who complain are those who are at the end; they say that the adjoining fields have been washed by the overflowing of the drains. It empties into the Kim.

7. Q. The people near it complain?—Yes, there were various causes of complaint, one is because it takes too much water away when there is no rain.

8. Q. They do not want the drain?—No, because it passes through their fields and they have to give up some of their lands for it; it is constructed, they think, to their prejudice.

9. Q. What is your impression of these drains?—I think they are important and that they do some good.

10. Q. Would the surrounding fields be benefited by drains?—Yes, but the area is so far away from the drainage channel that the benefit will be minimised.

11. Q. Would you not take the drain into that area?—I do not know what the result will be, because the people are against it, they will resent it if the drain passes through their lands. Their leading members have to give up lands, that is why they complain; that was the conclusion I arrived at from my inquiries.

TWENTIETH DAY.

Surat, 11th December 1901.

WITNESS No. 37.—MR. GOPALJI GULABHAI, Mamlatdar of Jambusar Taluka, Broach District.

Answers to printed questions.

I.

Mr. Gopalji. Paragraph I.—There has been but little, very little of irrigation in the talukas wherein I have served as Mamlatdar, and so my opportunities of observation have been very limited. But I have had an acquaintance with cultivators, some of whom now and then raised irrigational crops in their fields, or who know of their wants as agriculturists, and I had had opportunities of sometimes discussing the subject of irrigation with them. As Mamlatdar, I had had also an opportunity of knowing, in a general way, something about irrigational and other lands. It is depending on this so-called knowledge and experience that I have prepared the following notes on points Nos. 2, 3, 6, 7, 8 and 9 out of those mentioned in the Memorandum accompanying the Government Resolution No. 2275, dated 26th October last.

Paragraph II.—The gross area of this taluka is 247,519 acres and 32 gunthas, and the culturable area is 172,350 acres and 25 gunthas. About 2,000 acres out of the latter area are protected by wells, and about 2,250 acres by small tanks, and about 300 acres more by other nominal sources of water. There are no Government irrigation works or private works other than wells in this taluka. The soil is of three kinds—(1) the Light brown or alluvial, (2) the Black, and (3) the "Besar" or half-way between the Light and the Black. The cultivation is not at all dependant on artificial irrigation. The average annual rainfall is about 35 inches and extends from June to October. During the south-west monsoon there is ordinarily no demand for other water. There are no crops grown in this taluka such as require irrigation excepting "Dangar" and "Kodra" which in years of scanty rainfall require to be watered; for this purpose, tank water and well water is sometimes used when it is available, though it is rarely so available. About 150 acres of land are annually grown with "Marchi," Pepper, "Ringni," Eggplant, "Dungli" Onion and Tobacco, and they are watered by wells. They require to be watered every eighth day. Marchi and Ringni are sown in the month of July and require to be watered in this way for four months after the rains are over, that is to say, from November to February. "Dungli" is sown in the months of November and December and require to be watered for five months, that is to say, from November and December to April and May. Tobacco is sown in the month of August and requires to be watered for about three months, that is to say, from November to January. There is no irrigation revenue realized in this taluka.

Paragraph III.—Black soil is not favourable for irrigation. It requires much water and is difficult for weeding and for turning water and other purposes, which require the cultivator and his men to go into it. It becomes hard and cracked in the fair season and takes in any quantity of water, and when saturated, it becomes so soft and sticky that one cannot tread over it without a good deal of inconvenience. Small tanks in black soil hold water very well and more thoroughly than those in light soil, which hold

water, only if the bed is of gravel. In the village of Nadiad, which is a Bara village with black cotton soil, there is a small tank of about 8 acres which is not deep and yet holds water throughout the 12 months of the year, notwithstanding it is much used by cattle. The population of the village is very small, but hundreds of cattle and sheep, which come to graze in the waste lands near the village, drink water thereof. In the village of Kapuria, which is also a Bara village with excellent black cotton soil, there is a tank of about 10 acres, which was got excavated to a little depth at a cost of Rs500 two years ago, and since then the water therein lasts throughout the year. The tank of Kareli (a village with light alluvial soil) which is about 12 acres and which was excavated deep four years ago, does not hold any water at all, for the bed being not a gravel one is porous.

High earthen dams can be made of black soil without masonry core walls. They will allow water to percolate for a time, but when settled and overgrown with "Kodra" or other grass, they become strong and will not be either washed away or cracked. Besides, so long as black soil is in touch with water, it will not become porous and will remain sticky.

The tanks mostly consist of portions of low-lying ground, which are excavated, and where, on account of their low level, monsoon water rushes in from the surrounding high lands, often of a large extent and is collected.

When the land irrigated is black soil, there is not any demand for water during a season of average rainfall, for, the land, though it wants more water, retains it longer. For example, tobacco which is grown in the month of August, does not require to be watered until November, if it is in black soil, while it requires to be watered in light soil, when the rain holds off for a time. I cannot say whether the irrigated area in black soil shows a falling off in years of fair or good rainfall, or whether the revenue is on that account more precarious than in the case of other soil commanded by tanks, for there is not much of irrigation in this taluka. There is a desire on the part of owners of black soil rice-lands that there should be more of irrigation works which might water their lands when the rain stops short in the end, and which might ensure their rice crops; in such cases the construction of tanks would be as remunerative and as important as in other classes of soil.

Paragraph VI.—By district and village works, I mean the large tanks which are almost invariably to be found near the site of every village and the small tanks that are to be found in numbers in every village and are supposed to be useful to the surrounding field-owners and their cattle and to irrigate some of the nearest fields—rice plots—on occasions of scanty rainfall in consideration of a small payment called "Himayat" or "Kassar" on account of water, which is incorporated with the land revenue proper and is fixed by the Survey Department at the time of the settlement. I believe the levy of this special revenue will be discontinued at the Revision Survey.

It is not known who constructed these tanks. The larger tanks near the village sites were, I believe, excavated by the new settlers themselves, when they established the village or by those who settled them there. They dug the tank and used the earth to raise its banks and to raise the village site to erect houses on them. Every village site has invariably one such tank attached to it. There are also numerous smaller tanks in every village "Sim" and they are very probably either the result of the charity of the religious and the rich or the result of the labour of the agriculturists and others owning or cultivating land in the neighbourhood. These tanks are all now controlled by Government. There are about 100 of such large tanks and about 500 of such small tanks in this taluka. There is no cultivation entirely dependant on them, but there are about 2,250 acres of land below them, the survey assessment on which is fixed in consideration of the producing capacity of the land, jointly with that of the water-supply available for its irrigation at the time of the settlement, and on the assumption that that water-supply will be maintained at about the same standard throughout the period of the lease. The rates for the use of the water and of land are, as remarked above, consolidated, and occupants are under the liability to pay the full rates (whether the tanks are in order or not, and whether they have water in them or not, and whether their water is used or not) or in default to resign their holdings. The lands paying this assessment are almost entirely "Kiari" or rice-plots.

The obligations of Government, as a great landlord, to maintain in an efficient state these sources of water-supply for the use of which it charges rent, are manifest. Cultivators should not therefore be required to contribute any portion of the cost of repairing them. But some assistance may, in fairness and in accordance with usage, be demanded from them; it will extend to a few days' labour before the setting in of the monsoon in each year, for filling rat-holes, making up banks worn down by cattle traffic, clearing small water courses and similar petty earth work repairs. But so far as I know Government have not spent any amount on these tanks. Several of these tanks are not worth maintaining as irrigation tanks by Government, and they might be left to the cultivators to maintain or not as they please, the lands below them being treated for assessment as dry crop lands. The larger tanks used for village water-supply are maintained at the cost of local funds, with such voluntary contributions or other assistance as can be obtained from the villagers, and, when occasion justifies it, by grants-in-aid from the Provincial assignment for the improvement of village water-supply.

No new works of this class have been constructed of late years. District Local Boards do not undertake such works, and private land-owners also do not do so, though I have observed a case or two of their digging such small tanks for their convenience—more for the extra water of their fields to collect as also for the use of their cattle and themselves, than for irrigational purposes.

Paragraph VII.—The total area irrigated by wells, in ordinary years, is about 150 acres, and 2,000 acres in a year of drought. Not a single new well was constructed during the last ten years, excepting 116 wells, which were constructed during the famine year and a few local fund wells for drinking purposes. Rupees 38,730 were given out as takavi for constructing new wells during the famine year, the majority of these wells have been left more or less incomplete by the people, most of whom did not want to borrow more, either because the water of the wells was not good or because the wells served their purpose, though incomplete, or because of other reasons. I think it both possible and desirable to stimulate the construction of new wells by grants of takavi—larger in amount and on more liberal terms—in about a dozen villages at least in this taluka, where the chances of getting sweet water are surer than in other villages, and where the population is thick. During the droughts of 1899-1901, the water in some wells ran short (and some of them became more brackish in the Bahara villages); several of those that ran short of water as well as those that were always short of water were deepened, being mostly bored by the native instrument called a "Shaada" and almost always with the result that the waters became copious, but brackish. In this way about 50 wells were abandoned. The average depth of water is 50 feet below the surface in the Bahara villages and 60 feet in other villages. An ordinary well would cost 800 rupees and it would irrigate about 8 acres of land. I know only of one irrigation well that fully improved by being bored.

Paragraph VIII.—There were complaints from the Mr. Gopalji. people of several villages in this taluka to the effect that monsoon water accumulated in their village site and in their "Sim," that going to the fields and from one village to another was rendered difficult on that account, also that the people suffered in health on account of the water-logging around the village site, which often contained much filth from manure-heap grounds and grounds where people obeyed calls of nature, and that men as well as cattle suffered throughout the monsoon and for a good long time thereafter, having to tread in mud and water on their daily rounds. Above all crops were also injured by this water-logging. The following drainage channels were excavated to remove these difficulties about ten years ago :—

11 Dec. 01.

- I. The Amanpor-Nadiad Channel about 6 miles in length, passing through the lands of Amanpor, Tundaj, Rampor, Kava and Nadiad.
- II. The Kora-Madafar Channel—
 - (a) passing through the lands of Kora, Panchakda, Sambha Jantran and Madafar,
 - (b) and the Jantran-Madafar branch, passing through the lands of Jantran and Madafar, both altogether $6\frac{1}{2}$ miles in length.
- III. The Sindhav Channel draining the lands of Sindhav.

The following channels were excavated during the famine year, and thereafter as famine relief works; they were also needed on the same account as the above ones :—

- I. The Nobar-Umra-Koteshwar Channel, passing through the lands of Nobar, Umra and Koteshwar.
and the Dabha-Umra branch, passing through the lands of Dabha and Umra; both altogether 6 miles in length.
- II. The Uber-Dabha Channel, 2 miles and 740 feet in length, passing through the lands of Uber and Dabha.
- III. The Nodhna-Nobar Channel, 5,300 feet in length, passing through the lands of Nodhna and Nobar.
- IV. The Vad-Madafar Channel, passing through the lands of Vad and Madafar.
- V. The Vansetta Channel, 3,100 feet in length, passing through the lands of Vansetta.

Other drainage channels are still required, partly on sanitary, but chiefly on agricultural grounds. They are the following :—

- I. In Hankhi.—The drainage channel to begin at the entrance of the village of Hankhi, where water accumulates during the monsoon, and to end in the river Dhadhar;

this would save the crops (cotton) of the fields on its sides from destruction when the rains are heavy, for they remain under water; it will also be useful on sanitary grounds; this channel would be of about 2 miles in length. About three other smaller channels, each of about a mile in length, are also wanted in the fields around this village, to be useful to the people of this village as well as Gajera, Uchhad, Vehlam and Jafarpara; the channels to end either in the Maniari Khadi or in the Khadi of Magnad.

- II. In Mahapura.—This village badly wants a channel from the village site to the Dhadhar—a distance of less than a mile—to save its crops from destruction during a year of even ordinary rainfall.
- III. In Kava and Vad.—A channel is necessary all along the road from Vad to Kava—of about 3 miles in length. This would be useful to the surrounding fields; it will discharge itself in the Amanpor-Nadiad Channel, near the village of Kava.
- IV. In Shigarna, etc.—Small channels are necessary in the "Sim" of the villages of Shigarna, Sardarpara and Chandpor, the channels to unite and discharge thereafter in the Amanpor-Nadiad Channel near Nadiad.

Mr. Gopalji. For the last half a dozen years, the rainfall has been comparatively light in the taluka, and hence there is not at present a great cry for channels, but the above-mentioned ones would be useful. The majority of the people want them.

11 Dec. 01.

These channels would not be very expensive and their cost should be met with from the local funds, where they are useful from a sanitary point of view; and from Provincial grant, where they constitute useful improvements. They are likely, in my opinion, to result in an increase of revenue, as also to ensure prompt payment of revenue and to lessen the burden of the cultivator, who would be easily able to pay his assessment, when he will be saved from injury to his land from water-logging.

There is a complaint in some of the villages of the taluka that the drainage channels sweep away the fertile surface soil and leave an inferior one in many places, full of "Maradias" or little white gravels, of which lime can be made, and I have reason to believe that their complaint is partly correct. Fields which formerly grew "dangar" and "juar" or wheat are now not fit for anything but cotton. Formerly the water collected in the low-lying lands and it was used to irrigate the drying fields of "dangar" when the rain held off or ceased or was not sufficient. Again, the grass and other natural growth remaining under water decomposed and served the purpose of manure; "juar" was sown in the fields when they became sufficiently dry, and those that were not dry by that time were later on sown with wheat or gram. Instead of all this, now the water at once flows away by the channels; the result is that the fields adjoining the channels are in several portions washed away and cut up and they become often unfit for anything; the others also suffer more or less. Grass and other useless plants grow apace, and weeding costs a good deal. Besides the time for sowing comes at the same time in all these lands and it is short, and hence the people do not get that long time for sowing as they formerly did, when there were no such channels. Formerly they sowed the light brown soil in the beginning of the monsoon with bajri, kodra, cotton, etc., or the black soil, in which water did not accumulate, with cotton, etc., and when they were free from that they took these black soil fields in hand where the "varap" was late on account of the accumulation of rain water; whereas now the "varap" comes on at the same time as in the other fields, and hence there is less time available for sowing.

The people say, they gained a good deal for a few years after the channels were dug; but now they say they are losers. "Dangar" crop has been reduced to almost nil in these villages and its place as well as that of "juar" and wheat, has been taken by cotton, which, however, does not now turn out successful on account of the irregularity or insufficiency of the rains, and which is not so paying as formerly owing to the reduction in price.

During the last famine year I was told by some people of Jantran that their channels should be filled up, so that they might serve as famine relief works and might also do good to them. The complaint is very strong in this village, because the rice-crop which formerly grew in abundance here has disappeared a few years since, partly because the rains are not heavy, but chiefly because there has been too much draining off of the useful monsoon water. In the rest of the villages, there is either no complaint, or what complaint there is would disappear with a heavy rainfall.

Such channels prove more useful in light soil than in black, for if the water is not drained off in black soil, the land can be sown with later crops such as juari or with wheat and gram, etc., when the water dries up; but in the case of light soil fields, if the water is not drained off, the time for sowing bajri, kodra and cotton passes away, and when the "varap" takes place, the time for sowing is over; the light soil does not grow *rabi* crops, such as wheat, etc.

It may be mentioned that these channels are merely drainage channels constructed to carry away monsoon water, and they are not irrigation canals. No water is drawn from them for irrigation, and they contain no water after the close of the monsoon. Some of these channels, on being repaired and provided with waste weirs, can be at a little cost transformed into large lakes for storing water, but I do not think they will thereby serve any useful purpose. An experiment may, however, be made with part of the Jantram-Madafar branch channel, about which there is a great complaint and which may prove of some use.

Paragraph IX.—The following tanks were excavated as famine relief works during the last famine. They are all

large tanks useful for miscellaneous purposes to the people, but not used for irrigation.

	Rs.
1. Dabha	1,12,000
2. Tankari	1,44,000
3. Shigam	1,21,000
4. Jambusar	94,000
5. Kavli	41,000
6. Kalak	11,000
7. Dolia	6,000
8. Pisad	8,000

Tank No. 7 has decidedly improved. As regards the rest it appears their beds have not been "formed"; for though they are deep, they do not hold water as well as some of the shallow tanks are known to be doing. None of the beds are, however, porous to a great extent, and a little silting will, it is supposed, improve them. These tanks have undoubtedly improved the water-supply of the villages; the four tanks of Dabha, Jambusar, Tankari and

90 A 70 A 72 A

Shigam are large reservoirs which will be useful in a year of 34 A

drought; but for greater usefulness and to serve their purposes in full, masonry waste-weirs should be provided for all of them excepting Jambusar, which has already got them. Shigam and Pisad tanks may be said to have gained nothing by the excavation; for the former, while it gets water by one way, loses it almost entirely by another—both the ways being in part the same; and the latter has no income of water, having probably lost it by the new Umra-Koteshwar channel. The big tanks of Dabha, Tankari and Shigam will, I hope, in the long run, be utilized for irrigational purposes also, if they are furnished with waste-weirs and maintained properly, for they will then contain an abundance of water much more than would be required for all other possible wants of the residents of the villages.

I am of opinion that the big ravines of river Mahi to the north of this taluka in the limits of the villages of Vedach, Piludra and Kareli can, at a comparative little cost, be converted into vast lakes and be utilized to irrigate the extensive "Bhatha" or alluvial lands below, in which Babul trees flourish and which can be reclaimed without much difficulty.

II.

1. My answers refer to the Jambusar Taluka in the Broach District. I have been Mamlatdar of this taluka for the last three years.

2. The average rainfall is as follows in each month of the year, the average being of the last 10 years:—

Name of month.	Rainfall.	
	Inches.	Cents.
January	0	1
February	0	11
March	0	1½
April	0	.
May	0	2
June	7	83
July	13	18
August	7	13
September	4	34
October	1	52
November	0	28
December	0	1
	34	44½

3. The following are the obstacles to the extension of irrigation in the taluka:—

(a) Sparsity of population—

The taluka has an area of 386½ square miles. The population is, according to the last census, 61,846 souls. Thus it comes to 160 to a square mile; a large portion out of this is comprised of non-agriculturists, i.e., tradesmen and labourers. In the villages of Kanwa, Kareli, Piludra, Vedach and Gajera, where there is something of irrigation, the population is four times the average of the taluka, being 640 per square mile, and it consists almost entirely of agriculturists.

- (b) The unsuitability of the black cotton soil to irrigation—

The greater part of the land of the taluka is black cotton soil. There are totally 87 villages, of which 22 are "Bara" or sea-coast villages with entirely black soil (assessment R95,000), and 46 are "Nim-Bara" villages, the greater portion of the land of which is black cotton producing soil, (assessment R2,62,000), and 19 villages only with light brown soil (assessment R1,16,000). Thus the greater portion of the black soil.

- (c) Lack of capital for the initial expenditure and of funds for the more expensive cultivation of irrigated crops—

The initial expenditure would be—

R 800 for a well.

" 150 for a pair of bullocks.

" 25 for Kos-Varat, etc.

R 975

The seeds cost a good deal for some of the irrigational crops; the plying of a "Kos" costs nearly one rupee a day. Most of the people are too poor to incur this expenditure.

- (d) There are other reasons also; for example,

I. The Bhagidari tenure, under which each Khatedar holds large holdings; he cultivates the best lands of the Bhag himself and rents out the rest. The tenants, even if they have the means which they generally never have, do not dig a well or make other improvements in their land, for they are annual tenants, and if they make any improvement, their rent is enhanced or their lease is cancelled. Out of 85 villages in the taluka, excluding the Inam ones, there are 55 such Bhagidari villages.

II. In other villages also, the holdings are large, and so the occupants do not find it necessary to labour hard to maintain themselves, and they do not therefore take to irrigation. They raise cotton crops which do not entail much labour and which yield a good outturn. An acre of first class cotton land yields more than 18 maunds of seed-cotton, which means nearly 75 rupees. Why should the cultivator then toil for an irrigational crop which involves more trouble and more expenditure and is not likely to pay more?

III. Again 48 per cent. out of the total occupied area of the taluka is Inam land, and the owners do not like to exert themselves having only a small amount to pay to Government in the case of these lands also, the great portion is in possession of annual tenants who would not make improvements therein.

IV. The greater portion of the cultivating classes are Kolis, Rajputs and Bohoras, who are not fond of irrigation.

V. Sweet water is rare in the greater part of the taluka, which is great obstacle to irrigation.

VI. Lastly, the mischievousness and laziness of the lower classes—agriculturists as well as others—who steal and injure the valuable irrigational crops: this keeps back a good deal of irrigation in Jambusar town for example, where there are numerous sources of water capable of irrigation.

4. Under the Survey Settlement, enhanced assessment is levied on all lands which are irrigated from any source of water, whether a well, a tank or a water-course, etc. In cases, where this source of water was looked upon as a permanent one, and appeared to have been used, the Survey Department fixed the enhancement to be taken, and consolidated it with the land assessment proper, and it is levied even if the source of water ceases to exist. I have known of a case in which a well, for which such assessment was levied, went out of repairs, and yet the enhancement was not remitted, and of numerous cases of tanks, etc. where though there was no water for irrigation, the enhancement is continued to be taken. I also know of a few cases where such enhancement was remitted, because the wells for which it was levied were out of order. All other sources of water, i.e., wells, tanks, etc., which were not

so assessed for, were to be charged for at the rate of 8 Mr. Gopalji. rupees per "Kos" whenever their water was used, if they were in Government land. A "Kos" generally irrigates about 2 acres of land. In practice, however, these instructions were relaxed, that is to say, the full "Kos" rate was not levied, but a more or less partial rate only, particularly in years of scanty rainfall, when even no rate was levied in some instances.

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Tenants do not in any case extend irrigation at their own cost to the lands in their tenancy, for their tenancy is annual. In one village only, there are a few permanent tenants, but they do not make such improvements, for they are afraid of their landlords, and there is reason indeed that they should, for even a sub-sharer of one of these landlords who constructed a well in one of the fields in his share—6 gunthas assessed at R0-12-0—has been forced to pay R8 to his principal, on account of the existence of the well. I do not think that the existing provisions in this respect are sufficiently liberal, but it is expected, they would be after the revision Survey, when all such enhancements will be removed and substituted by a general sub-soil charge, though I do not understand on what principles and evidence the sub-soil capacity of the land will be determined. The system of enhancing rates for irrigation adopted at the original Survey did mischief, in my opinion, by deterring people from digging more wells.

As regards *kachcha* wells made in Government land after the original Survey, special rate was levied for their use in the same way as in the case of tanks, rivers and water courses, but that practice was stopped under Government Resolution No. 5815, dated 18th July 1884, Revenue Department.

The Commissioner, Northern Division, under his Gujara-
rati Circular No. 5, dated the 15th July 1885, issued instructions to the Collectors to the following effects:—

Certain wells being out of order and useless, no permanent rate was charged on their account at the original Survey, but when such wells were used for irrigational purposes, special rate was charged at R8 per "Kos"; but it must be remembered that before such wells are made useful for irrigational purposes, they would cost some trouble and expense to the cultivators, and hence nothing should be charged for their use in future.

This order is also being followed.

5. Loans under the Land Improvement Act are not freely taken by the people for the extension of irrigation. The reasons are partly the same as are mentioned in paragraph 3 against the extension of irrigation. Irrigation is not required by people in some cases, while it is not possible in other cases. The people therefore do not accept a loan to extend irrigation. Again a cultivator does not like to incur a debt to improve his land; he would gladly do so to buy seeds and bullocks or to buy a neighbour's field, as also to buy a house for himself or to give caste dinners, etc., but he would not, in the majority of cases, incur debt to construct a well; it is beyond his understanding to do so. Besides, he does not like to be a debtor to Government who will brook no delay in payment and who would recover it from him summarily—ejecting him and his family from his hearth and field and selling him up, so to say; he would prefer any creditor; by Government he would be granted a loan for strictly agricultural purposes only, while he wants it oftener for domestic purposes; and if he once resorted to the "Sarkar" and stands in debt to the "Sarkar" for more than his land revenue, he would be given up by his creditor. In ordinary years, people look upon one who accepts a loan from Government as a person of inferior means and he loses his position in society, people do not like the public to know their financial difficulties, and they incur debt in a way unknown to others; creditors likewise keep such transactions unknown from people of the class of their debtors. There is an old proverb that debts are to be kept secret. A loan from Government would be known by all. The majority of the people do a great many thing on credit; the chief of these are getting children married, which becomes an exceedingly difficult task if one's private difficulties are known throughout his circle. In the famine year, a large number of people accepted these loans, because they could not get any from their creditors and they saw that they and their bullocks could live by these loans, and could at the same time provide for themselves a source of water that might be useful in any year of scanty rainfall. The family laboured at the work and the bullocks also. I think that, in order to make these loans popular, the following rules should be adopted:—

1. All loans to be without interest.

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2. Small loans to be given in the first instance to make trial borings: not more than half of the loans to be recovered if the trial fails and in reasonable instalments, not to exceed in any year one-eighth of the amount paid by the grantee as land revenue to Government.

3. If the trial is successful, a further large loan to be granted and to be recovered in reasonable instalments—the amount of the instalment not to exceed in any year one-fourth the amount paid by the grantee as land revenue to Government: if there is a failure to obtain sweet water, not more than half the grant to be remitted.

6. I do not think that in this taluka, the extension of irrigation will tend to injure the remaining cultivation by attracting its cultivators to the irrigated tracts.

There is a desire evinced by the owners of rice-plot lands to have means of irrigation extended to their lands.

Tanks.

Paragraphs 23 to 33.—There are numerous small ponds throughout the taluka, the waters of which are supposed to be useful to the adjoining fields for irrigational purposes, and on account of which those fields have been paying a somewhat higher assessment: but none of them are actually used for the purpose, for they hardly contain sufficient water. These ponds are old ones and are now silted up and no money is spent on them either by Government or by any one else. Besides, I do not think, these tanks were at any time systematically used for irrigation: they were occasionally used when the later rains fell short for the "dangar" crops. There is only one tank in the taluka, namely, that of Survey No. 14 of Jantran, 3 acres and 19 gunthas, which once used to irrigate the surrounding rice "Kiardas"—8 acres and 3 gunthas in extent, assessed at R71-12-0 out of which R4-8-1 represent the "Himayat," but this tank is now not so used, because it has silted up and is out of order and on account of other reasons also.

The following are the details of lands that are protected by tanks and similar sources of water according to the Survey Department, who at the original Survey ordered the levy of permanent special assessment on their account, the said assessment being consolidated with the land tax proper:—

	Total Survey Numbers.	Area. A. G.	Himayat or special assessment. R. a. p.
Tanks	1,138	2,252 13	1,112 14 9
"Yoho" or water-courses	45	69 23	35 1 7
"Kans" or drainage-channels	6	8 26	4 13 8
Khal or hollows	69	153 39	74 7 8
"Marg" or road land	67	79 3	33 14 5
"Sowcharan" or low-lying grazing lands	2	1 11	0 13 6
Total	1,317	2,569 35	1,264 1 7

Whenever there is any water in these so-called sources of water-supply, and it is needed for irrigation, it is raised by artificial means by human agency and then carried by a drain to the fields.

Wells.

34. (1) The average depth of permanent wells is about 50 feet in black soil villages and about 60 in the rest.

(2) In wells of this depth the water-supply is from springs and is not liable to fail even in a year of drought, though in the sea-coast villages it becomes, in some cases, more or less saline in such a year. In these latter villages I have seen a step well which neither ran short nor in the least brackish in the famine year, when all the wells around it within a distance of five miles were affected.

(3) The average cost of constructing such a well is about R800.

(4) A well of the sort described above lasts for a century and more, if ordinary repairs be executed occasionally, such as the cutting of young trees growing on its sides, the filling in of bird-holes in the walls, and the repairing of ordinary injuries to the masonry.

(5) The water is always raised by means of a "Kos" which is drawn by a pair of bullocks.

(6) The average area attached to a well and commanded by it is 8 acres.

(7) The average area annually irrigated by wells is 150 acres.

The largest and best well in the taluka, is in the village of Novar, four miles from Jumbusar and about the same distance on the south of the river Mahi. It is at least a century old, and is situated at one end of the village tank. It is about 60 feet deep and is about 20 feet in water. It has a diameter of 26 feet, and 12 "Kos" can ply under it, more than 20 acres of land are commanded by the well, and they pay a total water rate of 55 rupees a year to Government. But only about 5 acres of land are annually irrigated out of the 20, and not more. It is a well to which, by way of an experiment, a small steam pump may be attached for the purpose of irrigating the surrounding lands. The well perhaps shows that artesian wells are not impossible in these parts. The well is going out of repairs from the top, and no one cares to repair it. In the Government records it is noted as a "Sarkari" or Government well.

35. Irrigation increases the value of the produce or land—

(1) by one and a half, giving a net profit of about R45, by rendering it possible to cultivate two harvests instead of one;

(2) by two-fold, by leading to the substitution of more for less valuable crops or varieties;

(3) by about two-fold in a—

(a) year of ample rainfall;

(b) by about the same in a year of scanty rainfall;

(c) by nothing in a year of drought, for the cost is very heavy and the yield is barely enough to maintain the cultivator and his cattle.

36. The total annual value of the produce per acre of land due to irrigation is—

(1) about 45 rupees on the average of a normal term of years; and

(2) about nothing in a year of drought.

37. The average annual rate per acre paid on account of irrigation by the cultivator to the owner in the shape of enhancement of rent is 10 rupees, and by the owner to Government is 3 rupees.

Government charge the rate on all lands which are commanded by the well according to the view of the Survey Department, whether they are irrigated or not.

The owner charges the rate on all lands which the cultivator takes up with intent to irrigate.

38. Serious difficulties are often encountered, both in the selection of a site in which a supply of water will be obtained and in the actual construction of the well.

The cultivator selects the site of a well either with the help of a Brahmin or some such other person who is a "Joshi"—an astrologer—or is versed in the popular estimate in the science of the selection of successful sites for wells, or with the help of relations and friends who have built wells or seen wells built. In the former case he takes the man's word and begins digging, and if there is a slight indication of his word proving true, e.g., the appearance of water at the stated depth, no matter brackish, he goes on hopefully. In the latter case, he and his friends select a site which is usually any piece of low level ground in the field, where water accumulates in the monsoon or which is near or in the direction of a successful well thereabout, or which is near a tree of a particular kind, such as the Jambuda, the Samba, the Vad, the Mahuda and the Umra or which is near by a bush plant of particular kinds, such as the Kamoi and the Chini-Bordi. None of these methods is however reliable, for numerous wells on sites approved under these systems have turned out failures during the famine year.

In digging a well, percolation water generally appears at a depth of about 15 feet; the sides of the boring through which the water percolates are all moist and they become more moist on account of careless taking out of the mud and water from the bottom. On this account the earth from the sides begins to slide in unless it is hard; in some cases the earth being of a loose sandy mould, it falls in of its own accord in large blocks or in heaps of sand, and injures the workmen below and renders the work impossible or at the best a costly and ill-success. To prevent this result, the cultivator resorts to the construction of what is called the "Toondi". In the first place a circular ring of "Samba" wood, called a Chakkar, of the circumference of the well is got prepared by a carpenter; it is about a foot or more in thickness, and nearly two feet in breadth; on this is mounted black-earth and brick work, and when the

whole reaches a height of about 12 feet, it is lowered down in the circular hollow by the skilful workmen who are called "Chakans" and are highly paid for their work. Further digging is done and the "Toondi" is lowered. This prevents further falling in of the earth from the sides, but increases the cost of the work.

When percolation water appears, the cultivator becomes hopeful. If the water is brackish, he thinks it is only percolation water and hopes that it would improve further down. So he goes on digging; then he constructs the "Toondi", and the work thus taken in hand seriously is proceeded with even if the waters do not improve, though it is abandoned before it is fully carried out. I know of several cases in which wells have been abandoned in this way. I know of two cases only in which the owners completed such wells at a great cost. I also know of a few cases in which the work had to be abandoned from the beginning almost owing to the falling in of heaps of sand from the sides.

I do not know of Government or a Local Body ever offering assistance in the shape of expert advice or trial borings or the use of boring tools. Such advice would of course be useful if of a reliable nature and could be given in the shape of trial borings and the use of boring tools.

During the last famine several people used a boring apparatus called a "Shaada" to improve their wells, but it generally met with an ill-success, inasmuch as though it brought out a copious supply, rendered it too saline to use.

Only one well was successful by being thus bored; it was brackish and it improved and became sweet on being bored. Only the other day I used the tool in a Local Fund well with success; the well was short of water, and it is now full of a copious supply of potable water. I also improved another Local Fund well in the same way two years ago.

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39. I am not in the favour of construction by Government of wells in land which is private property. In the first place the well might turn out to be a failure. Secondly, it will cost to Government nearly double of what it would to a private land-owner. Thirdly, the land-owner would decline to use it permanently; he might use it one year and not use it the next. So the well will not pay. Fourthly, it might create a sort of distrust in the mind of the land-owner that Government would increase his land-tax at the next settlement, if he used its water.

An experiment in the direction will not however be thrown away in a village like Gajera where the population is of Patidars and is thick and industrious and skilful.

40. Temporary wells are very rarely used in the taluka. If they are in a soil where the sides do not fall in, they are a very good protection against drought. I have seen only three such successful wells, one of which has been in existence these three years and is used for irrigation; but such cases are rare. A liberal grant of *takavi* will encourage the digging of wells of this sort, and if successful, the owners themselves will construct them *pakka* before long.

1. Q. (The President.)—You are Mamlatdar of the Jambusar taluka?—Yes.

2. Q. How long have you been there?—Three years.

3. Q. Where were you before?—I was in the Panch Mahals district for a short time. I was also in the Kaira district.

4. Q. You have been in the Jambusar taluka during the famine?—Yes.

5. Q. Did you lose many people?—Yes; we did.

6. Q. You have very little irrigation in that taluka?—Yes, very little.

7. Q. What do you irrigate?—Rice and *kodra*.

8. Q. (Mr. Ibbetson.)—What is *kodra*?—A small millet. We also irrigate chillies, brinjals, and onions.

9. Q. (The President.)—You say every village has got a tank?—Yes, for domestic purposes.

10. Q. Not for irrigation?—No; they are chiefly for domestic purposes.

11. Q. You say, "there is no cultivation entirely dependent on them (tanks)." It must be helped by rain?—Yes, it rarely requires help from irrigation.

12. Q. All these tanks were dry in the famine time?—Yes; all of them.

13. Q. Did they grow any crop inside the bed of the tanks?—Yes, maize with well water?

14. Q. You say, "the obligations of Government as a great landlord to maintain in an efficient state those sources of water-supply for the use for which it charges rent, are manifest?" Do people understand that they have certain liabilities as to the upkeep of tanks?—Some understand; some don't.

15. Q. There is no power to compel them?—No; certainly not.

16. Q. You say, "so far as I know, the Government have not spent any money on these tanks in this taluka. Several of these tanks are not worth maintaining by Government and they might be left to the cultivator to maintain or not as they please." Where do you draw a line?—For example, if a tank pays Government less than Rs. 10, 15 or 20 per year there is no use in maintaining it.

17. Q. Where do you draw the line at Rs. 20?—Yes; that would be the figure.

18. Q. You would give up the water-rate altogether?—Yes; it is a very small amount; it never exceeds 8 annas per acre.

19. Q. This proposal would cut out the 500 tanks?—Yes; we might retain 50 at the most.

20. Q. You have no wells at all?—We have a lot of wells, but they are rarely used for irrigation.

21. Q. They were worked in the famine?—Yes; even old wells were repaired; many were quite out of order.

22. Q. You say, "no new well was constructed during the last ten years excepting the 116 which were constructed during the famine year." Were these *kachcha* wells?—No; all *pakka*.

23. Q. How many wells were there before?—The total number amounts to 1,000 now; about 100 are out of repair; about 400 are irrigation wells.

24. Q. (Mr. Muir-Mackenzie.)—Are they in use at present?—Yes.

25. Q. (The President.)—You say 116 were constructed during the famine year?—Yes; and 300 were built before the famine year.

26. Q. You only irrigated 150 acres before the famine?—Yes.

27. Q. You say Rs 38,730 were given out for *takavi*; was it for these 116 wells?—Yes.

28. Q. That means Rs. 334 for each?—Yes.

29. Q. You say the majority of those wells have been left incomplete by the people?—Yes.

30. Q. I suppose they paid back the *takavi*?—No; the crops are too poor; they will pay eventually.

31. Q. You recommend an increase of the number of wells?—Yes; for years of drought.

32. Q. Even although they are not used between famine times?—Yes.

33. Q. You suggest that "it is possible and desirable to stimulate the construction of new wells by grants of *takavi*." You propose "free of interest entirely"?—Yes.

34. Q. You say, "during the drought of 1899-1900 the water in some wells ran dry and some of them became more brackish." Where was that?—On the sea coast.

35. Q. They did not get any benefit from deepening the wells?—No; they generally got salt water, though they got a more copious supply.

36. Q. That spoiled the wells?—Yes.

37. Q. You say 50 wells were abandoned owing to this?—Yes.

38. Q. In paragraph 8 you say, "that the people suffered in health on account of the water-logging around the village sites." How long has water-logging been going on?—For years; but the evil is being removed now; we have got drainage channels.

39. Q. You express a doubtful opinion about them?—In some places; I have limited my opinion in regard to one village particularly.

Mr. Gopalji. 40. Q. What do you mean by *varap*?—Dryness of the soil; that is the mischief of the drains.

11 Dec. 01. 41. Q. You say the channels dry too fast?—Yes. From almost every village there are complaints that the drains scour off the surface soil and do a lot of harm; also that the sowing time is now too short; formerly there were two classes of land—wet and dry; now all are dry, and have to be sown at the same time.

42. Q. Could not the drains be regulated by putting in sluices?—Yes; I think so.

43. Q. You say, "The people say, they gained a good deal for a few years after the channels were dry but now they say they are losers. How long is it since these drainage channels were made?—Ten or 12 years. They were made in 1891-92 and in 1891-96 more lands were taken up for cultivation by means of these channels.

44. Q. Before drought came did the people begin to complain of these channels?—Long before that.

45. Q. If the rains are heavy again these channels will be useful and the complaints will cease?—Yes; the complaint is really a serious one in only one village.

46. Q. How many villages benefit by it?—About 12 or 15; we want more drains yet.

47. Q. (*Mr. Muir-Mackenzie.*)—Do you think, in spite of these complaints, it would be advisable to extend the number of drains?—Yes.

48. Q. (*The President.*)—You say "In my opinion the big ravines of the river Mahi to the north of this taluka in the limits of the villages of Vedach, Piludra, and Kareli can, at a comparatively little cost, be converted into vast lakes." Is that area in black cotton soil country?—No; it is alluvial soil but there is not a single acre uncultivated in those villages. All the land is valuable, and what irrigation there is, is in those villages. At present the people pay at least Rs. 15 per acre for unirrigated lands.

49. Q. The Mahi river goes down to the sea; where would you make your bunds?—About a mile from the high bank.

50. Q. How many acres do they irrigate now?—It would be a thousand acres.

51. Q. Are the people rich?—There is good alluvial fertile soil and a thick population; there is not a single waste acre in the villages.

52. Q. You say in paragraph 4, "under the survey settlement the enhanced assessment" is levied on all lands which are irrigated from any source. Do these people apply for remission if the source ceases to exist?—No; only those who apply for remission get it.

53. Q. I understand that it is not the habit to apply for remission?—Yes. For some reason or other they do not apply; the tank assessment is so little that the people do not care to trouble about it or perhaps they don't know the rules. I know of some instances in which remissions have been granted and of one case in which it was not granted.

54. Q. You say loans are not freely taken up by people for irrigation?—It is only the rich that make wells themselves; the poor do not incur debts to make wells.

55. Q. Do you know of cases in other districts where grants are made for wells?—They are made here in our taluka as well as elsewhere, but the people do not like to run into debt for making wells in this part of the country where they are not fond of irrigation.

56. Q. Have you served in any other district?—Yes; in Kaira, where they incur debts to make wells.

57. Q. You say, "in ordinary years the people look upon a person who accepts a Government loan as a man of inferior means"—is that the case?—People do not like to take loans.

58. Q. (*Mr. Ibbetson.*)—Loans from a *bania* would have the same effect?—They can take from *banias* secretly, unknown to others.

59. Q. (*Mr. Higham.*)—If there is no assessment on small tanks as you propose, do you think the people would clear them out?—I don't think they would, because there would be so many sharers in the tank.

60. Q. They would have no reason to complain that Government did not do it?—When they come to know that it is to their benefit to keep their tanks in repair, some of the agriculturists might do it.

61. Q. You don't think they would do it ordinarily?—No, I don't think so.

62. Q. What sort of repair do they require?—A little removal of silt, repairs to the bank. Both can be done at the same time.

63. Q. Is it done annually or every ten years?—Once every five years; sometimes every couple of years.

64. Q. You could not make them do it?—It would be rather difficult. In the case of good rice lands, the people would do it of their own accord. I have seen one village in which they do it annually.

65. Q. The drains have led to cotton being substituted for rice?—Yes.

66. Q. Cotton is a more paying crop?—Yes, it is very profitable. People wanted the channels for the purpose of raising cotton. It has not paid for the last half a dozen years, as the rains are not sufficient. People complain that formerly they raised rice, juar, and wheat; but now the soil is not fit for these three crops. It is only fit for cotton.

67. Q. You say an acre of first class cotton land yields more than 18 maunds of seed cotton, which means nearly Rs. 75. Why should a cultivator then toil with the irrigation of a crop which involves more trouble and more expense? I understand the cotton crop is a crop most suitable to this country?—Yes; cotton pays best in Broach.

68. Q. Why then is there an objection to the drains? Did they complain before the dry years came?—No, they did not.

69. Q. Before the dry years came they liked the drains?—Yes.

70. Q. And they still want more drains. You are now making more drains?—Yes.

71. Q. (*The President.*)—I think you said that the land began to deteriorate before the famine year?—Yes; there was a complaint against some of the channels; not against all the channels. The complaints are justified to some extent, for in one place the soil has been washed away, particularly from the fields near the drains.

72. Q. You don't think complaints in other places are serious?—No, in other places they are not serious.

73. Q. Would not people be able to keep water on their fields by putting up little bunds?—Yes, they would.

74. Q. They have not done that because it would cost much trouble; they want Government to do it?—Yes.

75. Q. They won't help themselves?—No; that is true.

76. Q. I suppose these wells which were constructed all over the district would not be worked in dry years?—They would not be worked in ordinary years.

77. Q. Have they cattle to work them?—Yes.

78. Q. (*Mr. Ibbetson.*)—What are tanks used to irrigate mainly in Broach?—Simply rice.

79. Q. If you made an irrigation tank would the cultivator grow rice or cotton?—He would grow rice, but first he would have to make *kiaris*.

80. Q. You have got a certain number of irrigation tanks already made?—Yes, I hope they will make *kiaris* under four of those made last year.

81. Q. Does cotton pay better than rice?—Ordinarily rice pays better than cotton.

82. Q. I understood you to say that cotton paid better than rice?—What I meant to say was that excellent cotton lands pay well, but ordinarily rice pays better than cotton, especially when it is supported by irrigation and so made more secure.

83. Q. You say you don't think there is much hope of the people mending these small tanks even if the assessment was remitted?—No.

84. Q. Suppose Government made over the assessment to the Local Boards and gave them the water revenue to keep up the tanks, how would that work?—That would work well.

85. Q. Do you think they are capable of managing them?—Yes, in the case of a very few tanks.

86. Q. Why very few?—I think very few of the tanks would pay the Local Boards to maintain them.

87. Q. If tanks could not be kept in order by the Local Boards how could the people keep them in order themselves?—They can supply the labour themselves and do the work more cheaply.

88. Q. Could not the Local Boards get the people to help them?—Yes, to some extent.

89. Q. They would be more likely to do it than the Public Works Department?—Yes; more likely to get the help of people.

90. Q. (*Mr. Higham*).—Would the Public Works Department do it by their own means or by means of the people?—By means of the people; they would have to pay their own people as well as other people.

91. Q. (*Mr. Ibbetson*).—Would not the Local Board be able to make a small tank pay where Government could not?—I don't think Local Boards could make it pay.

92. Q. About wells; you say it is possible to a great extent to increase the number of wells; do you refer to the black cotton soil or only to alluvial?—Chiefly alluvial and black cotton soil where water is sweet.

93. Q. Do you get sweet water in black cotton soil?—Yes.

94. Q. Have you seen the people irrigating all sorts of crops by means of wells in Broach in black cotton soil?—Yes, I have, in villages in the west where the soil is *pakka* black cotton soil.

95. Q. What sort of crops do they sow?—Onions, ground-nuts and wheat.

96. Q. Does that pay?—Yes.

97. Q. Do they irrigate steadily every year?—No; they do an acre or two; people who have tried it do it; ordinarily they do one or two acres in every village.

98. Q. What is the proportion of alluvial soil to black cotton soil?—About one-third light brown and alluvial.

99. Q. That is one of alluvial to two of cotton?—Yes.

100. Q. What interest does a solvent occupier pay to a *bania* if he borrows money to make a well?—Not less than 9 per cent.

101. Q. We have been told 8 per cent.?—No, I do not think that can be so. I shall not get it myself for less than 9 per cent.

102. Q. I suppose the reason why people don't make more wells is that in ordinary years unirrigated crops can be sown which pay well?—Yes, they don't think it worth while to make wells.

103. Q. Your object in remitting interest is to make it worth while?—Yes, so that they may be useful in years of famine.

104. Q. You would like Government to show more liberality?—Yes; liberality should be shown in times of famine.

105. Q. How many famines have there been in Broach in the last 100 years?—Perhaps one or two.

106. Q. How often would the people irrigate in ten years?—Perhaps one year in ten. Some of the people who know the benefits of irrigation irrigate always.

107. Q. The ordinary peasant, how often would he irrigate?—Once in ten years; the well would rarely be used except in the 12 villages where they are accustomed to irrigation; and it would not be kept in repair.

108. Q. About these drains; they complain of the scouring of the surface soil?—Yes, some fields have been damaged by scour. I saw it myself.

109. Q. Have they done much serious harm?—They have done some harm, but much more good than harm.

110. Q. (*Mr. Rajaratna Mdlr.*).—By means of embankments could you not prevent the cutting up of the land?—Yes, the cultivator does that, but he has to leave an opening to let the water pass off and that always causes cutting; and generally results in scouring to the surface soil.

111. Q. By putting a small embankment the damage can be minimised, if not entirely prevented?—Yes; that is being done.

112. Q. You say, "black cotton soil is not favourable for irrigation?"—That is our experience every day. In the famine year we saw lands irrigated for the first time in black cotton soil.—I have not got any personal experience, but the people say that black cotton soil is simply unsuitable on account of its soft and sticky nature.

113. Q. (*Mr. Muir-Mackenzie*).—Does it not require a great deal more water?—Yes.

114. Q. (*Mr. Rajaratna Mdlr.*).—Have any remissions of instalments been granted for failure of wells?—No.

115. Q. How long does it ordinarily take to dispose of the applications for advances for wells?—In the majority of cases they are disposed of within ten days; miscellaneous

applications are disposed of within fifteen or twenty days, *Mr. Gopalji*. even in one month sometimes.

116. Q. You have few applications?—Yes.

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117. Q. In paragraph 4 of your second note you say, "I have known of a case in which a well for which such assessment was levied went out of repairs and yet the enhancement was not remitted; does not the Tahsildar report and get the assessment reduced?"—I have not done it yet.

118. Q. You say rayats never apply for remission?—No, I think it is the duty of the Revenue officers to see it and report.

119. Q. The fact that the rayat has not applied for it does not prevent the Tahsildar from reporting on it and getting the assessment reduced?—Sometimes we look upon it in another way; we say it is his business to keep them in repair.

120. Q. (*Mr. Muir-Mackenzie*).—The number of Government wells is very small?—Yes.

121. Q. What is the assessment on land under Government wells; so much per *Kos*?—Yes; rupees 8 when it is not permanent; when it is permanent the average is from eight annas to Rs. 3 per acre.

122. Q. Do you mean to say that if there are Government wells and a man does not get water he does not complain?—Really the people look upon all wells as their own property. Even wells in Government lands are supposed by the people to belong to them. The rayat will not allow us to repair the wells. They say, "the well is ours." I know of several such cases occurring in the famine year. I went to repair them and the people said "no." Our records show that they are Government wells while they say that the wells are theirs.

123. Q. They do not require grants from Government?—They have had grants in some cases.

124. Q. In term "irrigation revenue" you don't include the extra amount of assessment that is levied on land which is under small tanks?—No, that is always excluded from the figures for "irrigation."

125. Q. On what grounds do you believe that the enhanced assessment (on account of irrigation) is going to be discontinued at the time of the Revision Survey?—I understand that a general sub-soil rate is going to be substituted.

126. Q. You say that the people are charged *himayat* rates even when there is no water in the tanks?—Yes.

127. Q. Have they made no complaint?—No.

128. Q. What is the reason of that?—The charge is so small that they hardly care; it is a very nominal charge of two to six annas per acre.

129. Q. That is for sub-soil water?—No; it is a tank rate; the best small tank in Jambusar irrigates 8 acres 3 *gunthas*; the total assessment was Rs. 71-12-0, out of which Rs. 4-3-1 represented the water charge.

Mr. Muir-Mackenzie.—The assessment on tank irrigation is very trifling.

130. Q. (*Mr. Rajaratna Mdlr.*).—What is the total assessment on that land?—Rs. 5.

131. Q. That is land assessment?—Yes; it includes Re. 0-5-3 on account of the tank water.

132. Q. If the tanks were entirely dry, the dry assessment would also be remitted?—Suspension of revenue would be granted.

133. Q. (*Mr. Muir-Mackenzie*).—You say an ordinary well costs Rs. 500 in black cotton soil?—I have taken the expenses of a brown soil well.

134. Q. I want to know the cost of a well in black soil?—It would be nearly Rs. 700.

135. Q. Less in black soil than in brown soil?—Yes; because the depth would be less.

136. Q. The depth is less in black cotton soil?—Yes, at 50 feet we are sure to get copious water.

137. Q. You are not sure whether it is sweet?—No.

138. Q. Sometimes you go down and get a copious supply of brackish water?—Yes.

139. Q. Was any attempt made within your knowledge to bore still further in the hope of again getting sweet water after meeting brackish by the first deepening?—Yes, but they have not gone down much; it is difficult with an iron instrument.

140. Q. Have you seen many of these drains?—All of them.

Mr. Gopalji. 141. Q. There is damage to the adjoining fields?—Yes, generally to the villages that are on the lower course of the drains.

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142. Q. Not so much to the higher?—No; some higher villages complain that there is a defect in the channel, which does not carry away the water quickly enough.

143. Q. There is no question about the upper villages liking the channels?—No; although some injury may be caused to individual fields, there is no doubt that the people have seen many of these channels now and believe that they are effectual in clearing water-logged lands. Some of them cut branches to them.

144. Q. (The President.)—Is there salt in the water-logged villages?—No.

145. Q. Have you ever seen the soil washed away by drains?—No.

146. Q. Are the water courses in which these drains fall sufficiently deep or do they require to be deepened?—They are sufficiently deep.

147. Q. Would you advocate an increase in the number of tanks?—No; in the number of wells; but small tanks may be made.

148. Q. You would not build new tanks?—No, not except those I recommended in the ravines of the Mahi. There a new tank may be made with the object of creating additional agricultural land.

149. Q. Irrigating Bhatba land?—Yes.

150. Q. In black soil you don't advocate any new tanks?—No.

151. Q. You admit that rice is a safer crop than cotton?—Yes; with small irrigating tanks.

152. Q. Why would you not advocate the extension of tanks in the black soil country?—The people knew about these things and they have already made all the tanks possible.

153. Q. They have taken up all the available sites?—Yes.

154. Q. You say, "where the chances of getting sweet water are surer than in other villages and where the population is thick." Do you think that the large population is entirely the effect of irrigation being there?—No, the irrigation is due to the population and to the superior soil.

155. Q. What soil is that?—It is brown soil—gorat—and good sandy soil.

156. Q. It adjoins Kaira?—Yes.

157. Q. Could the people not be induced to repair their own tanks?—It is difficult; it depends upon the Patel and Revenue officers and Agewans.

158. Q. (Mr. Muir-Mackenzie.)—Do you think the Revenue officers take a personal interest in the matter?—Yes, as regards the village and water-supply tanks; but it is difficult for the Revenue officers to attend to all these irrigation tanks. There is not one irrigation tank to each village, but several in each village.

159. Q. If they could attend to it, it could be done?—I think so.

160. Q. Have you never managed to do it in the case of a single tank?—I have managed it in one village.

161. Q. If you had time you might have got it done in another village?—Yes.

WITNESS No. 38.—MR. SYED SHAMSUDDIN KADRI, District Deputy Collector, Surat.

I.—Answers to printed questions.

A.—General.

Mr. Kadri. 1. The answers refer to the Olpad Division in the Surat District.

11 Dec. 01. I am District Deputy Collector in charge, Olpad Division (consisting of Olpad, Bardoli and Mandvi talukas).

2. The average rainfall in the division during the years preceding the famine of 1899 is as under:—

KHARIF.	RABI.	
June to middle of August.	Middle of August to middle of October.	Middle of October to end of December.
Inches.	Inches.	Inches.
35	11	1.50

3. (1) In Mandvi and Valose, there is a great obstacle to the extension of irrigation arising from the sparsity of Kaliparaj population.

Not so in Bardoli and Olpad.

(2) The Kaliparaj have not got strong bullocks for irrigation. Some Ujliparaj have got sufficient cattle suited to the cultivation of irrigated land.

(3) The eastern villages of the Olpad taluka have not got sufficient supply of manure.

(4) In some parts black cotton soil is unsuitable for irrigation, but not so every where.

(5) Uncertainty of the supply of water is an obstacle.

(6) Lack of capital for the initial expenditure and of funds for the more expensive cultivation of irrigated crops is no doubt a drawback. The leather bag and leather rope for drawing water cost at the outset about Rs 30 and hardly last more than a year. The maintenance of strong bullocks and servants increases the cost of irrigation.

(7) There is no fear of enhanced rent or revenue assessment as the revision survey rates are guaranteed for 30 years.

(8) There is no uncertainty of tenure.

(9) No other reasons.

4. The land irrigated from works constructed by private capital is exempted from enhancement of assessment on account of irrigation until the introduction of the revision survey. The exemption is secured in practice as nothing more is levied.

The exemption from enhancement of rent is extended to tenants if the lease be a long one, but generally tenants do not care to spend much money in improving the land which does not belong to them. No alteration of the existing provisions of law is necessary.

5. Loans under the Land Improvement Act are taken by those Ujliparaj Khatedars for the extension of irrigation by means of *pakka* wells who have got land suitable for irrigation.

(1) The rate of 5 per cent. interest is not high compared with the exorbitant rate of compound interest charged by the money-lender, but a reduction to 3 per cent., if possible, would certainly be a great encouragement.

(2) Remission of interest is not necessary.

(3) I am not in favour of the partial remission of the advance.

(4) Partial remission may be granted in case of failure of the attempt to obtain water, but such cases would be rare. No well is built *pakka* until the cultivator is sure of a sufficient supply of sweet water. He incurs only the loss of digging a *kachcha* well at first, and the amount may fairly be remitted in case of a failure.

(5) The period of repayments is sufficiently liberal under the rules. This is no grievance.

6. As the area to be irrigated is generally small and is undertaken only by agriculturists of means, the extension of irrigation does not injure the other cultivation. In some parts of the Bardoli taluka, people would be glad to have the means of irrigation increased.

B.—Canals of continuous flow.

C.—Canals of intermittent flow.

There are no such canals in this district, and I have no experience of such canals.

D.—Tanks.

23. (1) The tanks in the Olpad Division are supplied with rain water from the outskirts of the village and the area commanding the tank.

(2) The water is distributed upon the land by means of an ordinary hand-made lift and small drain passing through the field.

(3) The supply depends upon the capacity of the tank and the area to be irrigated. If the tank be full of water, the supply lasts till December, but if the area of the rice land be large, it runs short earlier.

(a) In a year of ample rainfall the supply would last till April.

(b) In a year of scanty rainfall the supply would last till September or thereabout.

(c) In a year of drought, the supply is insignificant.

24. (a) In the year of ample rainfall irrigation increases the produce of the land three times by rendering it possible to cultivate two harvests and by increasing the yield.

(b) In a year of scanty rainfall the yield would be nearly double.

(c) In a year of drought the yield would be one time.

25. (1) By commencing the irrigation too late the crops either wither or do not grow vigorously.

(2) By too early cessation of the supply the yield is poor.

26. When the water in the tank runs short, if the agriculturist has a well available, he irrigates the land by means of the well to save the dying crops. These cases are rare.

27. (1) An approximate estimate of the increase in the total annual value of the produce per acre on an average of normal years would be Rs. 50.

(2) In a year of drought the yield would be about half of the normal year's.

28. Omitted.

29. It costs about Rs. 5 per acre to bring the water to the field and prepare the land for irrigation.

One that cultivates the land, whoever he may be, has to incur the expense. The tenant has no security for recompense. It is not the practice.

30. The Public Works Department looks after the irrigation tanks. The system of clearing silt and repairing the tanks does not work well, and it is highly desirable to have systematic arrangements made for repairing and excavating irrigation tanks at least in the course of ten years.

31. There are no tanks constructed by private persons.

32. If the land be supplied to people free of charge and exempted from assessment, several persons who have got land suitable for irrigation, would combine together and construct a tank by means of a *takavi* loan given on their joint security.

33. Inconvenience is experienced by the holders of rice land in particular when the tank is silted up. This difficulty is keenly felt in the rice tracts of the Olpad taluka, where, for several years, people fail to get rice for want of help from the irrigation tanks. If these tanks were properly excavated, they would have supplied some water at least even in a year of scanty rainfall, and there would have been some outturn of rice.

E.—Wells.

Mr. Kaari.

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34. (1) The average depth of wells in the Mandvi taluka is about 50 feet, it is about 35 feet in Bardoli and Olpad.

(2) The supply is generally from springs and from percolation only in rare cases. The supply from springs runs short in a year of drought and that from percolation fails. The water becomes brackish and sometimes too saline if an effort is made to deepen wells in the Olpad taluka.

(3) The average cost of constructing a *pakka* well is about Rs. 400.

(4) The average duration of a well is 40 years if kept in repairs. There are some large old wells of about 100 years' standing.

(5) Water is usually raised from a well by means of "kos and varat" (leather bag and rope).

(6) The average area attached to and commenced by a well depends upon the diameter of a well. A well of a maximum diameter is capable of 4 kos being drawn in the four directions. From 5 acres to 25 acres can be commanded by a well.

35 and 36. The answers to these questions are the same as in the case of questions Nos. 24 and 27, with this difference that the expenses of supplying water from a well are heavier than in the case of a tank.

37. (1) The enhanced rate paid per acre by the cultivator to the owner of land with irrigation facilities is nearly three times the assessment of the land.

(2) The water-rate charged by Government is included in the assessment of the land. It is nearly as much as the rate for soil and ranges between Rs. 4 and Rs. 6 in the Olpad and Bardoli talukas and is paid on the total area.

38. (1) Serious difficulties are encountered in the Olpad taluka in the selection of a spot in which a supply of sweet water will be obtained because there is the danger of the water turning out saline.

(2) In the Mandvi taluka and Valore Mahal, serious difficulties are encountered in the construction of wells, because the subsoil is stony and stones have to be blasted. In some parts of the Olpad taluka the soil is "Chopda," and the well does not stand.

It would be an encouragement to the people if they are helped with expert advice and boring machines.

39. I am not in favour of constructing Government wells in private land, because the people would not like to pay the water-rate when they don't irrigate the land, and the income would not be worth the expense. At present if agriculturists use the water of a Government well by means of one "kos," they have to pay Rs. 12 for sweet water in the Olpad and Bardoli talukas and Rs. 6 for brackish water. In Mandvi the rates are Rs. 8 and 4 respectively.

40. Temporary wells are used by the Kolis of the western coast villages of the Olpad taluka to grow vegetables.

They afford some protection against drought. In a year of scanty rainfall *takavi* is freely given for the construction of *kachcha* wells, and 162 such wells were constructed by the people with *takavi* during the drought of 1899.

Memorandum by Witness.

II.

I am in charge of Olpad, Bardoli, and Mandvi talukas.

Olpad taluka is capable of being divided into three parts—

1. The Western Coast villages, the soil of which is mostly loose sandy which requires rain in September and till November for mixed crop. Sweet water can be found within a depth of from 10 to 15 feet, and the water-supply is percolation. If a well be sunk deep, the water is brackish. One-third of this taluka is impregnated with salt.

2. The central villages have brackish water underneath. Some of these villages have sweet water wells for drinking purposes.

3. The water-logged villages are in the east. They fare well in point of crops when the rain is scanty and during the famine of 1899 they were well off.

In the Olpad taluka, on the list of the Irrigation Department there are only 40 tanks which irrigate upwards of 20 acres, but in the whole taluka there are about 503 tanks,

small and large, which irrigate less than 20 acres each. There are 127 *pakka* wells for irrigation and 986 wells for other purposes. It is possible to make new tanks in the west which is subject to tidal waters. In 1899, the people of Bhagva, fishermen, raised about Rs. 1,500 privately and made a new tank. It would be advantageous to make several such tanks on the coast. They would keep off tidal waters, reclaim salt land and lead to an increase in the rice land. Famine labour can well be employed on such tanks. In this taluka there are 71,567 acres of unculturable land.

In the water-logged area, new tanks can be made and new rice land increased. Between Kudsad, Kareli, and Shivan, this experiment can be tried. For the Olpad taluka, I recommend firstly, the improvement of a large number of tanks already in existence, and secondly, to make new tanks on the coast and in the water-logged area.

The Bardoli Taluka.

This taluka has already 698 wells for irrigation and 1,443 for other purposes. With the exception of the

Mr. Kadri. Valore Mahal, this taluka did not suffer from famine. There is a tendency to increase irrigated crops. In 1891 the irrigated crops were in 843 acres, while in 1900 the area rose to 1,286 acres. This taluka has 42 tanks for irrigation and 55 for other purposes. This taluka is capable of irrigation, but the country is flat and a canal is not possible. If people be helped gratis with expert advice and boring apparatus, there would be an increase in the area under irrigated crops. This taluka has about 20 per cent. of rice cultivation.

The Mandvi Taluka.

This is mostly a hilly tract and the bulk of the population is Kalipraj (aboriginal tribes.) This taluka suffered from famine in 1899, and the Kalipraj did not avail themselves fully of the relief work far from their population. This taluka has only nine tanks for irrigation and 28 for other purposes. It has only 24 wells for irrigation and 383 for other purposes. The rice land is utilized by the Kalipraj and the rice beds are more like small ponds, from 3 to 6 feet in depth and unlike the ordinary rice beds elsewhere. It is possible to find new sites for small and large tanks in the taluka. Nallahs can be bunded. This will afford suitable relief to the Kalipraj and increase the number of tanks and thereby lead to some increase in the rice land. Wells have to be sunk very deep and the stony soil below has to be blasted. Kalipraj can also be employed in removing stones and weeds from their fields as famine labourers and in making rice beds and *bandharas* on their land.

During the last two years, about two lakhs of rupees have been spent in *takavi*. Of this amount about half was given for the improvement of land. About Rs. 50,000 were given for *pakka* and *kachcha* wells. More than Rs. 10,000 might have been spent in making rice beds and *bandharas*. With *takavi* 133 *pakka* wells and 163 *kachcha* wells in the three talukas under my charge. The Kalipraj have ordinarily to pay from 12 to 24 per cent. interest to the money-lender. The Ujlipraj pay from 6 to 12 per cent. Small tanks in a large number of villages are to be preferred to a few large tanks.

The Amba Pardi Tank is likely to submerge about 756 acres, some of which is good land under cultivation. It is expected to irrigate about 1,500 acres, but this is doubtful while the loss of culturable land under submersion is certain. The Kalipraj are not very fond of irrigation, and they have their own ponds where rice can be grown. The country is irregular with ridges and hillocks hardly fit for canal irrigation. The people are poor and may not be able to pay extra water-rate. If the Taluka Boards get the irrigation revenue of small tanks abandoned by the Public Works Department, and if they are helped by some further grant, they can more economically and advantageously improve these small tanks. There are 35 villages in the Olpad taluka which contain more than four tanks. Dihen alone contains so many as 22 small tanks. The small tanks in the taluka which are good many badly require repairs. Their improvement would lead to an increase in the rice land. The terms for *takavi* are liberal enough and those that require it take it without any difficulty.

1. Q. (The President).—You are District Deputy Collector of Surat?—Yes.

2. Q. How long have you held that office?—About 4½ years.

3. Q. Do you know this district?—I am familiar with the talukas of Olpad, Bardoli, and Mandvi.

4. Q. How many talukas are there?—Eight.

5. Q. You saw the effects of famine?—Yes; in Mandvi the only taluka that suffered from famine.

6. Q. There had not been famine before for a very long time?—No, I believe not.

7. Q. What do you think is the best thing to do to make this district strong to resist a future famine?—The circumstances of the different talukas are different, for instance, Olpad has three parts; one, the western or Sea Coast part, is very sandy; the middle is practically impregnated with salt; and the eastern part is water-logged. In the eastern part I would increase the number of tanks and improve existing tanks.

8. Q. Are there a good many villages without tanks?—Yes, in the Olpad taluka I find there are small and large tanks, in all 503; the Irrigation Department has taken notice of only 40; there are 31 villages which have got above four tanks each; in some villages there are 22 large and small tanks, there is another village called Mandroi which has 18 tanks.

9. Q. The area irrigated is very small?—Most of them irrigate 10 acres and upwards, the Irrigation Department has taken charge of tanks which irrigate more than 20 acres; tanks irrigating below that are not taken care of.

10. Q. What would you do for the western part?—I would propose the improvement of the existing tanks; there is also a possibility of finding sites for new tanks. A few fishermen in the coast villages constructed a tank for which we simply gave them a small contribution. It cost in all about Rs. 2,000.

11. Q. How many acres can be irrigated under such a tank?—That depends upon the capacity of the tank; at least double the area of the tank could be irrigated.

12. Q. What about other parts?—In the central part we find the water brackish; and the deeper you go the more salty it becomes. They have wells near the tanks which have drinkable water, but for irrigation purposes I think it is not suitable. Then in the eastern part there are water-logged areas which fared best during the famine; during the year 1899 I found that the water-logged villages were the most prosperous in my taluka.

13. Q. Have you inspected any of the drains?—Yes, I saw one last year; it has been lately constructed; it does not run through *mar* soil.

14. Q. Is it expected to do useful work?—Yes, so far as that village is concerned; but it was badly aligned and some of the lands have been scoured away.

15. Q. Is a good deal of rice grown on these lands?—No. These lands are capable of producing rice, but in order to make rice beds we have to store up water; we have found places where we can store up water, and when we get a storage tank, a lot of the surrounding land can be converted into rice lands.

16. Q. Do you advocate an increase in the number of tanks?—Yes, small tanks; if we improved these small tanks which are at present mostly silted up, the people would be ready to increase the area of rice lands. They do not do so now because there are no possibilities of irrigation.

17. Q. Don't they prefer cotton to rice?—I don't think so. Rice is always a paying crop because you can grow two crops followed by wheat; besides cotton is subject to certain diseases.

18. Q. What are the general features of the Bardoli taluka?—The largest area is under rice. In 1891 they irrigated 843 acres, while in 1900 they irrigated 1,286 acres, that shows that people are fond of irrigation and that they would extend it if they had the means.

19. Q. This taluka possesses a good many wells?—Yes, 693 for irrigation and 1,400 for other purposes.

20. Q. As regards Mandvi its hilly tracts are mostly populated by aboriginal tribes?—Yes, they are not very fond of irrigation; the population is very sparse; on the hills irrigation is not practicable.

21. Q. Would it not be practicable to find a site for a reservoir?—Yes; they have found one place at Amba Pardi. I saw it personally, I do not think there is any great chance of that scheme being successful; the greatest objection is that while it would irrigate perhaps 1,700 acres it would certainly submerge 756 acres of the best arable land; it is mostly *khari*, and the prospects of agriculture are doubtful. For the same cost I could get 200 tanks excavated which, taking an average of 15 acres, would easily promote rice lands to the extent of 3,000 acres that would help three talukas of mine.

22. Q. Generally speaking you recommend tanks?—Very strongly; small tanks; I would also recommend an increase in the number of wells.

23. Q. Is there a large increase going on just now?—No; during the famine year and last year I had about 296 wells added to my charge.

24. Q. (Mr. Ibbetson).—Were they built *pakka*?—There were 133 *pakka* and 163 *kachcha*.

25. Q. (The President).—We have been told that the people do not like to borrow money?—That is a mistake I

noticed during the last two famines that they took *takavi* very rapidly for the improvement of their lands. They have made new rice lands and recently they have also grown grain.

26. Q. You think they availed themselves of *takavi* freely?—Yes.

27. Q. Do you think any encouragement is necessary so that they may be induced to make still further improvements?—We have already had the orders of Government to show them leniency in the matter of the remission of *takavi*.

28. Q. Do you think it would be a good thing for Government to lend money without interest for a certain time?—I do not think it would be a good thing, because when they go to the sowcar, the sowcar charges them from 12 to 24 per cent. interest. I think the interest charged by Government is small enough. In certain cases if Government would grant remission the people would appreciate it.

29. Q. (Mr. Muir-Mackenzie.)—Remission during famine?—Yes.

30. Q. (The President.)—You found that the people required no encouragement here?—I don't think so, they appreciate the grant and take advantage of it wherever it is possible. For the information of Mr. Muir-Mackenzie I may be permitted to say that between Kareli and Kudsad there is a tank where a reservoir and a small drain for water-logged areas could be built.

31. Q. In certain places you think it is advantageous to have an extension of tanks?—Yes.

32. Q. The increase in the number of wells is going on without Government taking any action in the matter?—Yes.

33. Q. You don't see any necessity for pressing the people to make new wells?—I think they want special inducement, but I would let them have boring tools and the services of an expert; they are afraid of certain sites, because they are doubtful as to whether sweet water will be found.

34. Q. Supposing a man finds good water, would you make him pay anything?—No, I would give assistance free. I think it is better to increase the number of wells by giving them help.

35. Q. You recommend that more money should be spent than has been spent hitherto upon the systematic improvement of tanks?—Yes, I am sorry to say that very little is spent for irrigation purposes. I would propose that in the Mandvi taluka, where famine was bad and where we have got a very small number of tanks, Government should let off interest; places can be found where new tanks can be made, and this would lead to an increase of rice lands. Mandvi has got only nine irrigation tanks and 28 other tanks; but there are facilities for increasing their number.

36. Q. You say the place should be surveyed and examined?—Yes. I have already found 12 places which, if approved of by the Public Works Department, are likely to be taken up.

37. Q. You think that the best work for famine labour is the improvement of those drainage channels?—Yes.

38. Q. You would make these tanks beforehand as protective measure; you would not wait for famine to arrive?—The sooner we could do them the better.

39. Q. What sort of work would you put famine labour on?—If I had to open famine work in the Mandvi taluka, looking to the characteristics of the people, I would certainly propose village works, because during the last famine there was a central large work opened for them where the bulk of them would not go steadily and many people suffered. I should prefer to have small village works.

40. Q. In each village?—No, in a group of five villages.

41. Q. The repairing of these tanks could go on?—Apart from the Mandvi taluka if we construct tanks, they would lead to an increase in the number of *kari* (rice) lands. That would be a very great improvement. Apart from that, I think, we can very well employ the people in clearing up lands, stones and weeds.

42. Q. (Mr. Ibbetson.)—You told us of one village where the people made a tank, costing Rs. 2,000 with a small grant from Government?—It was a contribution of the fishermen of a village who serve on steamers. They are not agriculturists, but they raised a popular contribution in the village of Rs. 1,500. They are sailors and most of them own land.

43. Q. If that can be done in one village, why should it not be done generally?—It can be done. If the Irrigation Department chooses to undertake the work, the people would come forward to pay one-tenth share. Recently in the Olpad taluka two villages did this by contributing Rs. 400.

44. Q. These people paid more than one-tenth?—Yes, because this was entirely a new tank, and they were anxious to do it.

45. Q. Why not have more tanks made?—We can, that is my scheme, we have got waste lands, and we have succeeded in making tanks. I think we shall be able to sweeten the soil and increase the area of rice lands.

46. Q. Could you get this done in the coast villages?—Yes; that is the most appropriate place.

47. Q. (Mr. Muir-Mackenzie.)—It cannot be done in Mandvi?—It is rather hilly, there is want of sites for storage, during my 15 days' tour I have been able to find 12 nice sites, which I believe the Public Works Department will approve of, they are in a good catchment area.

48. Q. (Mr. Ibbetson.)—Could you get the people to make the tanks?—No, they are too poor.

49. Q. Why are you in favour of small tanks? Why do you not advocate big ones?—Because their number would be small and they would not help many of the people.

50. Q. There is also the question of distribution?—Yes.

51. Q. Have you any other objection to big tanks?—I do not know of any other.

52. Q. You would rather have ten tanks irrigating 1,000 acres than one tank irrigating 1,000 acres?—Yes.

53. Q. You get a sure supply from the big tanks?—In the case of ample rainfall the supply, in my opinion, would be more in ten tanks than in one single tank.

54. Q. You say that the *bania* charges 12 to 24 per cent. interest to a cultivator who borrows money for building a well?—I was talking of Kaliparaj (hill tribes). The money is borrowed not only for building a well but for other ordinary purposes.

55. Q. That is in Mandvi?—Yes.

56. Q. Outside Mandvi in the other talukas, what is the rate?—About 12 per cent. would be the rate.

57. Q. To a solvent cultivator?—It may be less.

58. Q. Could he borrow at 6 per cent.?—For him to obtain that rate he must be very solvent and must mortgage his ornaments. When a *bania* lends Rs. 300 or Rs. 400, he gets some security and charges less interest.

59. Q. (Mr. Rajaratna Mdlr.)—There are about 450 tanks which irrigate less than 50 acres according to your account?—Yes. In Olpad alone.

60. Q. Do you mean $\frac{1}{2}$ of the total assessment?—Yes; we gave this concession so that the people would repair the tanks. I think if these tanks were handed over to the Local Boards with a share of the irrigation revenue and some further grant from the Provincial Funds, and that if the people also give some contributions, there was a chance of improving these tanks.

61. Q. Could not the Revenue Department manage to undertake these repairs with a small establishment?—Instead of creating a separate agency I would rather strengthen the agency of the Taluka Board who would be better able to manage it more economically, the Revenue Officers would take an interest in the matter and supervise the work of the Taluka Boards.

62. Q. What facilities have the District Board for supervising?—They have got their own staff, District officers, etc.

63. Q. They would be in charge of the Revenue officers?—Yes in their *ex-officio* capacity.

64. Q. What is the general mode of assessment?—It varies in different talukas.

65. Q. (Mr. Muir-Mackenzie.)—What is the average assessment in Mandvi?—From Rs. 2 to Rs. 4 per acre in Mandvi; in Bardoli I found it varied from Rs. 3 $\frac{1}{2}$ to Rs. 4 $\frac{1}{2}$, and in Olpad from Rs. 4 $\frac{1}{2}$ to Rs. 7 per acre.

66. Q. (Mr. Rajaratna Mdlr.)—Supposing we considerably reduced the rate, would the rayat be encouraged to construct small private tanks?—Wherever people have got rice lands, they can't spare them for making tanks.

67. Q. Are there not culturable waste lands?—No, not near rice lands.

68. Q. They can convert any land into rice land?—They can, if there are facilities for water.

Mr. Kadri.
11 Dec. 01.

Mr. Kadri. 69. Q. (Mr. Muir-Mackenzie).—Would they not be able to cultivate in the bed of the tank?—Yes, if the tank is not full of water.

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70. Q. In the rabi season they cultivate in the beds of tanks?—During the famine they were allowed to do so. I do not think that would lead to a great increase.

71. Q. (The President).—They are not now allowed?—No; in famine years they were allowed.

72. Q. (Mr. Rajaratna Mdlr.).—What is the unculturable area of the three talukas roughly?—I have got it accurately—

Olpad 71,567 acres.

B 16,137 „

73. Q. Is there a very large area which it is physically difficult to irrigate?—Yes, 71,000 acres are mostly salt land and subject to the overflow of tidal water. We would have to reclaim that.

74. Q. If waste lands were given on favourable terms would the rayat be encouraged to construct small tanks and to convert the land into *kiari* land?—They would.

75. Q. (Mr. Muir-Mackenzie).—On what favourable terms?—Rs. 12 *kiari* assessment.

76. Q. (The President).—If we reclaim waste land?—They would convert them into rice lands.

77. Q. (Mr. Rajaratna Mdlr.).—Does the fear of enhanced assessment prevent the rayat from extending the number of wells?—No; because they know for certain that there is no possibility of the rate being increased which is fixed by the Survey Department.

78. Q. Would you employ famine labour to dig *kachcha* wells?—Yes.

79. Q. Would that not only give employment to famine labour but also benefit the people?—Not to a great extent; it would give relief to some famine labour, because we cannot give employment to many thousands of people unless we undertake to construct hundreds and thousands of wells.

80. Q. What is the difficulty in digging hundreds of thousands of wells?—The difficulty is of supervision.

81. Q. It is under the supervision of the Public Works Department?—Yes.

82. Q. Instead of giving money in the shape of *takavi*, would you not grant famine labour?—The rayat will take to famine labour most readily if you do not wish to recover.

83. Q. We do not mean to recover?—If you charge the rayat for famine labour employed, then they would not accept it. First because the famine people are weak and they do not do that quantity of work which a strong, ordinary labourer would do. If you give inducements to a lot of people to take advantage of *kachcha* wells, you may expect to see hundreds of wells being constructed.

84. Q. (Mr. Muir-Mackenzie).—There is a great distinction between the three talukas in your charge, three differ from one another?—Yes, considerably.

85. Q. In the Olpad taluka do you consider there are large areas which may be reclaimed from tidal water?—Yes.

86. Q. They would be useful to employ famine labour on?—Yes.

87. Q. You think famine labour may be employed on reclamation works?—Yes, in the shape of tanks.

88. Q. And reclamation from tidal water?—Yes, at present I would like to see if the surrounding embankment would be made to serve the double purpose—the reclamation of the land and the storage of water; if we have a nice reservoir of water, a good deal of *kiari* land could be increased.

89. Q. You say in regard to giving employment to famine labour; “that is always my idea; have you made any

proposals?—Yes; that the tanks should be taken in hand on the coast villages.

90. Q. New ones?—The existing ones.

91. Q. You say, “they should be employed on making bunds and reclaiming lands from the action of tidal water?”—Yes.

92. Q. Take Mandvi?—I understand the country is hilly. —Yes, and full of ridges.

93. Q. You recommend the bunding of the water courses?—Yes.

94. Q. And clearing away sand?—Yes.

95. Q. Would you advocate the terracing of land in Mandvi?—I do not think so.

96. Q. There is no scope?—No.

97. Q. You granted a good deal of *takavi* for making new rice lands?—In all I have given 2 lakhs of rupees, half of which goes to the improvement of land.

98. Q. How much of that half has gone in making new rice lands?—I have not got accurate figures, but I can give you the figures.

99. Q. Could you give me an idea, 10,000?—I should say something more than that.

100. Q. Over Rs. 10,000 have been spent on the improvement of land and making new *kiaris*?—*Bandharas* and mostly *kiari*.

101. Q. In Olpad what was the form of famine labour?—Olpad did not suffer last time; this year they are not likely to suffer.

102. Q. In Olpad there is a considerable water-logged area?—Yes; in the east of the taluka.

103. Q. Are new tanks being made there?—There are old tanks, but there is room for new ones.

104. Q. The old tanks are being improved?—Yes, this year by the Public Works Department.

105. Q. Do the people pay the one-tenth contribution?—Yes.

106. Q. It is a simple execution of the ordinary rule that if people give 10 per cent. contribution, their tanks should be repaired?—Yes.

107. Q. Could new tanks be made in those villages?—Yes; it would be possible.

108. Q. Have people applied?—They have not.

109. Q. Not the people in your charge?—No. If tanks are made, the people would make rice lands.

110. Q. Mr. Wales told us yesterday that the number of acres raised by tanks is about 23,000 and that the outside area of rice in the district is about 80,000?—Yes.

111. Q. Do you think that new tanks could be made with advantage, so as to protect some part of the 80,000 acres which at present have no tanks?—I should think so.

112. Q. Do you think improvement of the existing tanks is the first thing?—Yes.

113. Q. Would you like them to come first?—Yes; after that I should certainly look to more tanks.

114. Q. Do you think there are sites and places where they could be made?—Yes.

115. Q. Do you think the people would not give up their lands?—Not in Olpad or Mandvi.

116. Q. Why not in Olpad?—In the water-logged areas there are lands now looked upon as waste which can be converted into rice lands.

117. Q. Water-logged areas may be converted?—Yes; if we can store up water we can create rice beds also.

WITNESS No. 39.—MR. A. C. LOGAN, I.C.S., Collector of Broach.
Answers to printed questions.

Mr. Logan. Paragraph 2—

11 Dec. 01.

	I.	Protected by Government tanks	Acres.	
			1,088*	*Only nominal protection, as these tanks do not actually irrigate any land, except in the monsoon.
		Protected by private tanks	1,279	
		Protected by private wells	720	
Gross area			3,087	
Culturable area			692,630	

By Talukas.

Talukas.	PROTECTED BY			REMARKS.
	Govern- ment works.	Private or village works.	Wells.	
	Acres.	Acres.	Acres.	
Broach . . .	...	...	149	These are the areas irrigated by wells in normal years. In famine years <i>kachcha</i> wells are dug as well.
Amod . . .	...	...	31	
Jambusar . . .	...	...	150	
Wagra . . .	24	100	70	
Ankleshvar . . .	384	67	302	
Hansot . . .	680	1,112	18	
Totals . . .	1,088	1,279	720	
GRAND TOTAL	...	...	3,087	

Character of the soil.—Three-fourths of the soil is black or cotton soil, three-sixteenths are *gorât* or wheat soil, and one-sixteenth is *bhâthâ* or tobacco soil.

By Talukas.

Jambusar.—About equally divided between black or partially black and light soil. The last soil in the eastern half is well wooded and contains plenty of sweet water.

Wagra.—Eastern half black : western light and largely salt.

Broach.—Almost all rich black, rest *bhâthâ*, and a little *gorât* near the Nerbudda.

Ankleshwar and Hansot.—Mostly black ; but about 14 villages near the old bed of the Nerbudda possess *gorât*.

Amod.—Three-fourths black soil : rest light, and in the west, salt.

Extent to which cultivation depends on irrigation—To a very slight extent. For normal years this has been shown above. In a year of scarcity *kachcha* wells are dug to some extent, and the area irrigated may be greatly increased.

Rainfall.

Talukas.	Average of 10 years be- fore 1866.	Average of last 10 years.
Jambusar . . .	23.28	34.64
Amod . . .	24.66	44.71
Wagra . . .	26.70	32.93
Broach . . .	37.68	44.65
Ankleshvar . . .	33.4	39.54
Hansot . . .		36.30

Demand for water in monsoon.—Ordinarily there is no demand for water in the monsoon. But there is some demand for tank water for *rice* and *kodra*. 11 Dec. 01.

Irrigated crops and their waterings.

Jambusar.—Pepper and *brinjals* are sown in July and require water every eighth day from November to February.

Tobacco is sown in August, and watered from November till January. *Onions* are sown in November and December and watered till April.

Total area thus cultivated is 150 acres. The irrigation is from wells. No special irrigation cess is levied on this land.

Amod.—The above crops and also sugarcane are sown in 31 acres of land irrigated from private wells. A *kos* cess of Rs-12 is levied.

Wagra.—Irrigation is practically confined to about ten villages in the east of the taluka with 35 wells which irrigate about 15 acres. The above crops are grown and watered every fifth day in winter. In two of these villages a *kos* rate of Rs per well is taken, as the wells appear to be the property of Government.

Broach.—The above-mentioned crops are sown in 149 acres of land irrigated from wells. The crops are watered once a week. A *kos* rate of Rs 12 is levied.

Ankleshwar.—An area of about 303 acres is ordinarily irrigated from private wells in about 14 villages with light soil.

Hansot.—There was no irrigation from wells before the famine. Now about 18 acres are so irrigated. About 1,112 acres of rice land are ordinarily irrigated from tanks during the monsoon. The distribution of the water is privately arranged by the khatedars. There is no separate irrigation revenue.

The general rule about water revenue in force in this district is that Rs 12 to Rs 4 according to quality of water, etc., are levied on well water taken to irrigate any land on which a water-rate has not been assessed if the wells were built before the Survey Settlement, or if they are Government property ; but not if they have been built or repaired since the Survey.

Paragraph 7.

Total area irrigated by wells.

Talukas.	Ordinary years.		Droughts.
	Acres.	Acres.	
Jambusar . . .	150	2,000	
Amod . . .	40	800	
Wagra . . .	70	400	
Broach . . .	149	149	
Ankleshvar . . .	303	697	
Hansot . . .	18	71	
TOTALS . . .	730	4,117	

New wells constructed annually during last ten years.

	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	1900-01.	Total.
Jambusar	116 K	...	116
Amod	1	3	1	...	24	2	...	28	13	72
Wagra	35 P 200 K	...	235
Broach	21	4 K	...	133 P 47 K	...	205
Ankleshvar . . .	3	5	...	3	2	...	11	...	15	...	39
Hansot	1	...	...	2	...	...	1	124 K 9 P	6	143

P=Pakka.
K=Kachcha.

Mr. Logan.

11 Dec. 01.

Takavi advanced for wells.

	₹	
Jambusar	38,730	in 1899-00. (Most wells left unfinished)
Amod	14,730	
Wagra	18,225	in 1899-00 ; 1,000 in 1900-01.
Broach	64,772	in 1899-00. Includes repair of 36 wells.
Ankleshvar	2,425	in 1891, 95 and 99.
Hansot	6,867	in 1899-00.

Concessions to constructors.

No special concessions are given to the constructors of new wells.

Measures to stimulate construction.

The construction of wells was stimulated by liberal grants of takavi in the famine year; and the practical results up to the present are not encouraging. From Jambusar it is reported that the majority of the 116 wells built from takavi have been left incomplete, because the water turned out bad or, more generally perhaps, because the unfinished well served a temporary purpose and the builder had never contemplated anything more. The Amod Mamlatdar refers to cases where the water proved brackish or insufficient. In Broach as in Jambusar most of the wells were merely *kachcha* wells used in the famine year only and now abandoned; but I have also a fine *pakka* well constructed in the famine, which has not been used since; and probably never will be, because even this year when there was six weeks of drought at an important time, the field round it bears a 16-anna crop without irrigation. In Hansot most of the Tagai was spent on merely *kachcha* wells.

It may be said with confidence that it is not desirable to stimulate the construction of wells in the black soil half of this district for two reasons; first that the cotton crop can probably do with less water than almost any other, and secondly, that the water in black soil wells is sure to be brackish or to turn brackish if the well is made deep enough to get a sufficient supply for irrigation. Nor do I believe that owners of cotton soil would respond to any stimulus except with the motive of handling Government money on easy terms, and getting a remission of the loan when, as calculated on, the well proved a failure.

In light soil villages, at any rate in those tracts where there is known or believed to be a fairly ample supply of sweet water (e. g., the north of Jambusar) it will be sufficient stimulus to offer takavi liberally, but on the ordinary terms, to khatedars who apply in good faith.

Extent to which wells have been affected by drought of 1899-1901.

Jambusar.—There are practically no irrigation wells to refer to, but some of the drinking wells ran short and others became brackish. The effect of deepening such wells was almost invariably to make them brackish. Only one well out of 51 deepened improved by boring. Distance of water 50 feet.

Amod.—Some small wells dried up, and the larger lost 30—40 per cent. of their water; and in some cases the water turned brackish. No wells are said to have been deepened; probably because the cultivators knew well what the result would be. Depth of water 60 feet.

Wagra.—There were no irrigation wells in Wagra before the famine year. Depth of water 30 feet.

Broach.—In no case was any well deepened, as none ran dry. Depth of water about 50 feet.

Ankleshvar.—Only one well fell into disuse. Most of the wells had to be deepened; but this was probably done with caution, as they are not said to have gone salt. Depth about 40 feet.

Hansot.—No well required to be deepened in the drought. Average depth 30 feet.

All these statistics refer to drinking wells for the most part as there are few irrigation wells to report on, and what is true of drinking wells will be approximately true of irrigation wells with the proviso that the conditions under which irrigation wells are made, as regards supply of water

and sweetness, will usually be less favourable than those of drinking wells, which are generally dug in carefully selected places on the banks or the beds of tanks.

The cost of wells for irrigation is variously estimated as follows:—

	₹
Jambusar	800
Amod	1,000—1,500
Wagra	700—1,200
Broach	500
Ankleshvar	600
Hansot	500

It may be taken that a good irrigation well will cost about ₹800, and that one *kos* will irrigate about two acres. I have not been supplied with Mr. Crimp's report on artesian wells.

Paragraph 8.

Water-logged tracts.

Jambusar.—The Mamlatdar mentions a need of small channels for the eastern border of his taluka, another in the centre between Vad and Kāvā and others at Sigarnā and Sarlārpur to the south. It is admitted that "owing to the light rainfall of the last half dozen years" there is not a great outcry for these channels; and that the channel made to drain Jantran about 12 years ago has ruined the cultivation of rice. The average rainfall of the last six years was 28 inches and the taluka is not likely to get better rain than this at any time; accordingly there would seem to be no need in Jambusar to enter on any of these dangerous experiments.

Amod.—The following tracts are reported water-logged "in very wet years."

Tracts:—

1. North of Itola,
2. West of Chaklad,
3. North of Sudi,
4. South of Tancha,
5. North-West of Ielod,

and small channels are said to be needed to prevent damage to the crops. The question may well be deferred till the "very wet" years come.

Wagra.—Two channels are said to be required "in very wet years" to drain water from the villages of Atāli and Ochvan-Keshvan; and the above remark applies to them also.

There are four important drainage channels in this taluka constructed from ten to five years ago. They are reported to be ruining the lands they drain by washing away the surface soil; and the people are said to be praying that they be allowed to silt up. A full report on the subject has been sent to Mr. Beale.

Broach.—Two channels already exist at Vagusna and Wausi.

There is a tract said to be water-logged in years of excessive rainfall between Sitpan and Nand (north of Janor), and the Public Works Department are believed to have a plan of channel ready as a famine work.

Ankleshvar.—There is already one channel in this taluka. The following 23 villages are said to be still water-logged and to need channels:—

- | | |
|------------------|--------------------|
| 1. Ankleshvar. | 12. Adādrā. |
| 2. Pānod. | 13. Sarthān. |
| 3. Chaprā. | 14. Kānvā. |
| 4. Umavādā. | 15. Nāgal. |
| 5. Alouj. | 16. Sajod. |
| 6. Sāpūrā. | 17. Māndvā Mātiad. |
| 7. Karmali. | 18. Divi. |
| 8. Ravidrā. | 19. Hajāt. |
| 9. Piludrā. | 20. Adol. |
| 10. Pardi Idris. | 21. Telwa. |
| 11. Sisodrā. | 22. Motwan. |
| | 23. Mandwa. |

Hanot.—Six villages on the the eastern border between Mangrol and Godadra are said to be water-logged for a week after heavy rain.

There are no existing channels in this Mahal.

Drainage channels are excavated by the Public Works Department with provincial funds allotted for that purpose. Presumably the Public Works Department will give the statistics relating to the return from the existing works, as I have not been called on to make any note on this paragraph of the memorandum; but whatever anticipations are raised from a temporary increase in the quantity of waste-land taken up near a channel at first, may be dashed by relinquishments in subsequent years should the channels all produce the results experienced in Wagra. At any rate the matter is evidently one requiring the greatest caution and ought to be left to the District Officers. Every proposed channel should be dealt with separately and on its own merits, and none undertaken without careful inquiry on the spot.

The total number of irrigation wells in the district is—

	Pakka.	Kachcha.
Jambusar	844	39
Amod	102	15
Wagra	40	...
Broach	333	54
Ankleshvar }	247	6
Han-ot }		
	1,066	114

II.—Note on the suggestion that rice cultivation should be encouraged in Broach district at the expense of cotton by digging tanks for irrigation.

I would most strongly deprecate any action by Government to encourage a substitution of rice for cotton in Broach. The natural tendency of the people, who know something of their own interests, is all the other way; if a man has a water-logged field which can grow rice he begs Government to make a drain that he may grow cotton. Possibly in a very wet year there may be a little more to be made out of rice than out of cotton: though not so much as is supposed; for the best cotton fields are said to yield as much as Rs. 80 per acre, and no Broach rice field would be likely to yield that. But the instinct which prefers cotton to rice is quite sound. For a district with light rainfall and tanks which will not hold water much longer than it is falling into them, cotton is undoubtedly the best and rice the worst crop to encourage. The following facts

establish this, as it seems to me, beyond question. In the famine year when all crops nearly failed rice failed utterly in every taluka except Ankleshvar; whereas the cotton entirely failed in only two talukas, and in Ankleshvar it was as good as the rice. Last year with a rainfall of 31 inches the following was the valuation of the two crops in the various talukas:—

Talukas.	NAME OF CROPS.	
	Cotton.	Rice.
Jambusar	8	1
Amod	10	1
Wagra	6	1
Broach	10	3
Ankleshvar	10	6

This year results are even more instructive. The highest rainfall was 24 inches in Jambusar; and the average for the district was 20. The rice crop has been a general failure: it may have been as much as 4 annas in Ankleshvar but nothing elsewhere. On the other hand, the cotton estimates (apart from the rats) given to me by my District Agricultural Inspector are—

Jambusar	20 annas.
Amod	20 "
Wagra	12 "
Broach	20 "
Ankleshvar	16 "

Thus while in three years of poor rainfall (the fall of 1900 ceased too soon, which is the worst fault rain can commit in Broach) cotton has varied from failure to abnormal richness, rice has remained at one dead level of failure. This crop with tanks and all behind it can often not produce a grain where cotton is producing 100 bolls to the tree. It is manifestly therefore the most unsuitable crop that could be suggested for encouragement as a stand-by in time of drought.

Nor it is possible to argue that rice might be sown first and cotton subsequently, should the rain or tank water prove insufficient for the former. It would not be possible to foresee the failure of the rice till about the end of August, and it would then be too late to sow cotton.

1. Q. (*The President*).—You are Collector of Broach?—Yes.

2. Q. What general measures do you consider to be the best to enable Broach to resist famine?—I do not think there is any measure of irrigation which would do any good, because there is no scope for irrigation. We could not possibly get water.

3. Q. There are wells, I suppose?—Yes, but the water-supply is limited, and they would be of very little use.

4. Q. The depth is beyond 30 feet?—Below thirty feet the water is salt; you can get a limited supply of sweet water but directly you increase the supply you spoil the water.

5. Q. Is that invariably so?—Almost invariably. Perhaps there may be small tracts where you get sweet water at a considerable depth, but I should say it is true for $\frac{2}{3}$ ths of the district.

6. Q. During the last famine when did the wells give out?—I was not in Broach during the last famine. Practically there is little irrigation from wells in Broach. All the wells give out about the beginning of the dry weather.

7. Q. The last famine was very intense and very long; was there any difficulty about drinking water?—As far as I could learn there was no practical difficulty about drinking water during the whole of the famine. There is always a slight scarcity of drinking water in the dry season, but I doubt if it was very much worse during the famine year.

8. Q. We have had evidence that there was a stimulus for the time being given to well irrigation by the construction of *kachcha* wells?—It made no really material difference. There were many hundreds of *kachcha* wells, but these were dug only for temporary use.

9. Q. Did they not lighten the stress?—They made no material difference. I doubt if 1,000 wells were dug and that would only mean about 1,000 acres.

10. Q. You don't see any prospect of improving the means of irrigation?—Of all the districts in the Presidency, Broach is the one which least requires artificial irrigation, because, with 17 inches of rain, good crops can be raised.

11. Q. You have had only one famine since you can remember?—Yes, only one within the memory of man; in 1899 we had only 12 inches of rain and the monsoon ceased. During the last two years there may have been famine in other parts of Guzarat, but there has been no distress in Broach which would be thought anything of, if there had not been a famine the year before. This year with 22 inches of rain we should have had a 16 anna crop in a greater part of the district but for damage done by rats.

12. Q. Famine has occurred once and so it may occur again?—Looking up at the statistics of rainfall there seems to be no ground for the popular idea that the rainfall has diminished. The figures show that the present rainfall is better than before.

13. Q. Three years ago you had famine?—Yes.

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14. Q. It may come again?—Yes, it may of course, but looking at the averages, there seems to be no reason to fear that famine will occur for another 50 years.

15. Q. Have you any water-logged parts in your district and are they increasing?—No, I should not think that they are increasing. Certain areas were water-logged, but we have drained them. There is a water-logged area still in Ankleshvar, but I have no reason to believe that it is materially increasing.

16. Q. Is there any question of remitting revenue on account of it, or of reducing the amount?—There is a letter from the Government on the subject.

17. Q. Do you know of any good done by drainage?—The people were pleased with the drains for the first two or three years, as they could grow cotton instead of wheat. They are now complaining that they wash away the surface soil.

18. Q. Have you had occasion to go into these complaints?—No, I have not had time to look at the lands myself. I have only just joined the district since this question cropped up.

19. Q. The Mamlatdar made personal inquiry and his report has been sent to Mr. Beale?—Yes, that refers to the complaints made by the people that the channels had done great injury.

20. Q. Has the report gone to the Public Works Department for consideration?—Yes.

21. Q. (Mr. Ibbetson).—Is it included in Mr. Beale's report.

22. Q. (Mr. Muir-Mackenzie).—Yes; (to the witness)—Do you consider that the report can be relied on?—Yes, I think so. I reported that in Wagra people said that the land had been spoiled, but that elsewhere there was not the same complaint.

23. Q. (The President).—I suppose that water-logged tracts have done best during the last 2 or 3 years?—There is no doubt of that.

24. Q. (Mr. Higham).—Could you tell me how many wells were constructed in Jambusar?—One hundred and sixteen.

25. Q. Are they *kachcha* wells?—Yes.

26. Q. The majority of these 116 wells were left incomplete?—Yes.

27. Q. How are they dug?—The people excavate a short way down, and when they get sufficient water they leave the well in that state.

28. Q. The Mamlatdar who came here just now said in reply to a question that they were all *pakka* wells?—I suppose he called them *pakka* because they cost Rs. 300. He may have called them *pakka* but they were very poor *pakka* wells, they have no *saining* or very little.

29. Q. Were advances given for them?—Yes, *takavi* was given.

30. Q. (The President).—I see Rs. 38,730 was given?—Yes, that was the *takavi* advanced for the 116 wells.

31. Q. That is Rs. 334 apiece?—Yes.

32. Q. (Mr. Higham).—They irrigated 2,000 acres?—They did.

33. Q. Whether they were *pakka* or *kachcha*?—Yes, only in that year; they were used only in the famine; no one had made any use of them since.

34. Q. Will they not be used in another famine?—They will all be filled by then. This year our rainfall was fifteen inches below the average, and still they did not use these wells.

35. Q. Could you not insist on their completing them, having given them *takavi* for the purpose?—It is generally found that the man has spent all the money he was given and he would again apply for more money; we cannot so control the expenses as to be certain that he has spent all the money on the well.

36. Q. He usually spends it on something else?—Yes, very largely.

37. Q. Do you know any of these reclamation works made in Hansot?—No; but elsewhere private reclamation works were undertaken, but none of them succeeded.

38. Q. I suppose it is only a matter of time?—We gave the people 20 years to reclaim the land; but the land is not reclaimed except partially, not enough to pay the cost, now they say it is not reclaimable.

39. Q. You are speaking of the reclamation scheme of some years ago?—I am speaking of the reclamation of salt lands.

40. Q. I was referring to the works made during the famine?—I have not got any personal acquaintance with those works.

41. Q. You don't know how they worked?—No; but my impression is that you cannot reclaim salt land in under 30 years.

42. Q. It is a waste of money trying to reclaim these lands?—Yes; in the Wagra taluka reclamations were attempted and enormous sums of money spent on them and yet the reclamations have not paid. In some cases the people have been absolutely ruined to my knowledge.

43. Q. It may not pay profit from a speculative point of view, but is it worth employing relief labour on?—No, I should not think so.

44. Q. Would you employ famine labour on tanks?—No.

45. Q. (Mr. Ibbetson).—You doubt whether the work will be profitable?—Yes. Nobody is satisfied with any of the tanks dug in my district by famine labour. The large tank which you saw is of little good for irrigation and is not required for the supply of the city, which was already supplied with water.

46. Q. Four or five very large tanks would be of no value?—I could not say until I had seen them.

47. Q. (Mr. Higham).—What else would you suggest for your famine labour?—Employment on good roads, which are the great want of the district.

48. Q. Where will you get your metal from?—The metal would have to be brought from outside, as we have not got metal in the district.

49. Q. Would you use famine labour to make the tanks?—Yes.

50. Q. Must the roads be metalled?—Yes, if they are intended to last any length of time.

51. Q. Work of that sort like railways employs very little labour in proportion to its cost?—Yes, but we should have something to show for our money.

52. Q. (Mr. Ibbetson).—Do you think you would be able to keep up these metal roads, supposing you made them in the famine?—Yes, the Local Board could do it.

53. Q. They would have to import metal?—Yes. We have made many roads and keep them in repair; the cost of making a new road is about Rs. 10,000 a mile. The Board now does a few miles every year besides repairs. If Government provided the capital cost, the Board could spend on repairs the money which it now spends on new works.

54. Q. Do you expect Government to pay for the famine labour and to give you the metal free?—It would be just as good as spending money on useless tanks.

55. Q. Not in useless tanks but on feeding a starving people. You propose to employ the labour on the earthwork of roads and to spend twice as much in importing road metal?—There must be some increased expenditure involved to Government. The Government would have to bear all the expenses, the Local Boards could not, especially in a famine year.

56. Q. I find in your note no expression of opinion about tank irrigation; you have strong reasons against trusting to well irrigation. Would you do anything to extend tank irrigation?—I do not think tank irrigation is irrigation at all, looking on irrigation as protection against famine; for when the rains fail the tanks fail.

57. Q. But does not the increased yield put the cultivator into a better position to resist famine, and thus there is less likelihood of his coming on relief?—That is so.

58. Q. I suppose tank irrigation is profitable to the people?—Yes, for rice.

59. Q. Do you think relief labour could be usefully employed in cleaning out the tanks?—I would have said that tanks are a useful form of relief until 3 or 4 months ago, but I now see cause to doubt it. Wherever I go people tell me that tanks are none the better for being cleaned.

60. Q. Do they give any reason for that?—The old bottom is disturbed.

61. Q. Do they ever ask for new tanks?—They ask for the excavation of village tanks which are used for irrigation and for cattle.

62. Q. Would you deepen the village tanks?—I doubt the useful effect of spending money in deepening village tanks; the soil has cracks, so that the more we deepen the tanks the more the water disappears.

63. Q. Do you think it is worthwhile doing anything to extend irrigation in Broach?—I think Broach district does not require any extensive scheme. The people are exceedingly shrewd, and good cultivators would dig wells no doubt; if they thought wells of any use they would dig them and they can get takavi for the purpose. My experience is that they won't dig wells even if you gave them the money free; if they did dig they would not use them as it does not pay to draw the water.

64. Q. The unirrigated crop is so good?—Yes.

65. Q. Suppose you had another famine next year and relief labourers to be employed somehow, do you think you could do any good to the district by employing them on irrigation works of any sort?—No, I should employ them, in the first instance, in digging out village tanks—the area for irrigation tanks is very restricted; it would be simply throwing away money to dig irrigation tanks in black cotton soil, where people are quite satisfied with getting their cotton. They don't want irrigation there.

66. Q. They would not substitute rice for cotton?—I think on the whole that they would not.

67. Q. They prefer cotton?—Yes.

68. Q. Apart from the question of assessment?—Yes, it is a very hardy crop and a profitable one.

69. Q. (The President.)—Has the question of employing famine labour to make navigation canals in Broach been considered?—Never to my knowledge.

70. Q. (Mr. Rajaratna Mdlr.)—There are several tanks in the district?—Yes.

71. Q. Do you think it would be possible to increase their capacity by raising the bunds; you object to digging and disturbing the soil?—I could not give a professional opinion on that subject, as I am not an Engineer.

72. Q. Is it not generally known that their capacity deteriorates owing to neglect to repair them. Could not famine labour be usefully employed in that way?—Yes, if the Engineers certify that the raised bunds would increase the capacity of the tanks.

73. Q. (Mr. Muir-Mackenzie.)—In some parts of your district there are considerable areas of waste water-logged lands?—No, not a very large area.

74. Q. An appreciable area?—Yes, but except in Ankleshwar they are mostly all drained.

75. Q. Do you think that drainage is the best remedy for them?—I do not know any other remedy. It is rather a dangerous thing to do unless it is done very carefully. You may take away more water than you ought to. I saw the drainage scheme that was first started in 1885, it was founded on the basis of draining off 5 inches of rainfall per day.

76. Q. It is only one inch here in Olpad?—I am referring to the report of Mr. Day; he says he found that the heaviest rainfall on any one day was 11 inches, so he prepared a channel to carry off rainfall in 2 days.

77. Q. Would it be any use running drains into tanks in water-logged areas with a view to create rice cultivation?—I think it is the best thing to drain into tanks below the drains.

78. Q. If you put regulators in the drains you might, to some extent, obviate the danger of taking off too much water?—That is a question for the Engineers to answer.

79. Q. Was famine labour employed on these reclamations you spoke of?—No, it was private enterprise.

80. Q. (Mr. Ibbetson.)—You say reclamations might take 30 years; but will they succeed in the end?—Of two men who undertook extensive reclamations one is stone broke. The other has large means and got a good deal of fertile land in conjunction with his reclamation. He won't tell me he has succeeded, for next year the Government assessment falls due, but I think he will stick to his reclamation.

81. Q. (Mr. Muir-Mackenzie.)—Do you think the term of granting takavi are sufficiently liberal?—Yes, I don't

think the rayats ought to be given money at a lower rate of interest than we have to pay.

82. Q. Could any further simplicity be introduced in the procedure of granting advances?—I believe that during the last two or three years takavi has been given with remarkable simplicity.

83. Q. But in ordinary years?—Inquiries must be made; first of all you must know the man's position, whether he is solvent. We ask the Mamlatdars to make inquiries.

84. Q. Do you think they are a bit slow?—Yes, in ordinary times, they are; but they have not been slow during the last three years.

85. Q. Do you believe that there is misapprehension and unfounded fear on the part of the people that if they make wells either out of their own resources or out of takavi advances they will be charged enhanced assessment contrary to the law?—Yes, they fear enhanced assessment if the well is made in their own land.

86. Q. They would be afraid of something more than if they left the land dry?—Yes; it is reasonable, as nobody knows to the contrary.

87. Q. It is in the law (reads from the Code, Section 107)?—At any rate the general feeling is that Government is inclined to assess improvements at every new revision. This morning I travelled along with a wealthy Parsee gentleman who said his assessment had been enhanced 1,200 times in the Revision Survey owing to his having improved his land.

88. Q. Do you believe him?—I don't believe him so far as the 1,200 times are concerned.

89. Q. You don't think the provisions of the Code are understood by the people?—No, I don't; but I may add that I think that when it pays they will make wells regardless of enhancement.

90. Q. Do you think, given tank irrigation, rice crops would be more profitable than cotton?—I do not think so, the people would never change cotton for rice. The people are very lazy. If an enterprising cultivator uses a good deal of manure with irrigation, I think that a rice crop might be more profitable than a cotton crop, but I am doubtful. There is so little rice in the district that I have never made a comparison of the profits. Cotton gives from Rs. 30 to Rs. 40 per acre.

91. Q. Mr. Mollison said it might give Rs. 100?—I doubt that except in very exceptional land. The people like growing cotton, because it gives them very little trouble.

92. Q. My point is this, if famine relief labour is employed upon digging rice lands it might help the people to grow a more profitable crop?—I am not sure how far it is a more profitable crop. I have not studied the question. I am very doubtful whether, if rice tanks were made all over the place, the people would change their cultivation in black soil.

93. Q. Are you aware that rice is grown with cotton. The cotton is intermixed with rice?—Yes.

94. Q. I understand from Mr. Mollison that in the year of excessive rainfall the cotton may fail and rice would succeed?—Yes.

95. Q. Under these circumstances would it not be possible to grow rice and make it a safer crop?—They have adopted rice in certain areas where there is a heavier rainfall or when they get surface drainage collected.

96. Q. You don't agree that the Nerbudda and Tapti would offer splendid opportunities for irrigating large areas of very valuable crops in the Broach district?—No.

97. Q. It is said that during the last 30 years there has seldom been a year of good rains. The rainfall returns contradict it. In former times the people used to say that Broach could not have a famine, because they could set a cotton crop with 17 inches?—I don't agree.

98. Q. We were told by an Assistant Engineer that the population in Broach was without occupation for seven months in the year?—They are fully occupied from June to March or for 10 months in the year; our difficulty generally is the deficiency of labourers.

(The President.)—We were rather astonished at what fell from that gentleman.

Mr. Logan.
11 Dec. 01.

WITNESS No. 40.—MR. JIVANJI LIMJIBHAI, Land-owner.

Memo. by this witness not printed.

Mr. Jivanji.

11 Dec. 01.

1. Q. (*The President*).—Of what place are you a resident?—Of Ilao in Broach.

2. Q. You say in your Memorandum "during the last thirty years I have seldom seen one year of satisfactory and well-timed rain, and then the crops above mentioned require one or two waterings by artificial means." Has there never been too much rain?—Sometimes there has been and sometimes scanty rain; it has not been equally distributed.

3. Q. There have not been many years in which there has been a 16-anna crop?—No, never.

4. Q. You say "people having black soil lands are anxious for tanks." In the Broach District, I understand, they prefer cotton to rice. Does cotton not pay better?—No, rice pays better.

5. Q. You say "the Tapti and the Nerbudda and the Keem rivers afford splendid opportunities for irrigating large areas of very valuable and highly productive lands in the Surat and Broach districts." Are not most of these lands black cotton soil?—Yes.

6. Q. Can they be irrigated by a canal?—Yes.

7. Q. We have had a great deal of evidence to the effect that they do not want water?—The rain is not equally distributed so they require one or two waterings for the cotton crop.

8. Q. Does the cotton crop not require water?—No, it does not.

9. Q. Do you think people living near the Tapti, Nerbudda and Keem would be glad to have canals running through there?—Yes.

10. Q. Would the water not go into the cracks in the land and be lost?—It would not go far.

11. Q. You say "far from any encouragement being given to well construction by means of concessions or grants, such construction is positively discouraged by an excess assessment being clapped on on account of the water-supply from the wells." Is that the case?—Yes, everywhere they charge a water tax.

12. Q. Do they charge a man who makes a well more than if he did not make it?—Yes, the rayats have to pay more.

13. Q. Do you mean if a man digs a well in his own land he would have an extra assessment put on in consequence?—Yes, two or three years ago this practically ceased.

14. Q. Then it is no use talking about it now. You are an advocate of having drains in *talukas* like Ankleshar and Oplad. I have heard that people complained that the drains do harm?—It is a mistake on their part to say so.

15. Q. Several witnesses have told us so?—Drains are especially required in water-logged villages.

16. Q. (*Mr. Muir-Mackenzie*).—Is there much water-logged land in Ilao?—Not in Ilao, but about three miles away there are water-logged villages.

17. Q. Is this within your personal knowledge?—Yes.

18. Q. (*The President*).—You say "building wells should be encouraged and advances should be freely granted and no interest charged on the same," do not people make wells for their own private use?—They have no means.

19. Q. (*Mr. Higham*).—Have you any land of your own?—Yes, about 400 acres in the Broach District.

20. Q. Have you any wells?—Yes, one well which irrigates five to six acres.

21. Q. Where is that well?—In Ilao.

22. Q. Do you work it?—Yes.

23. Q. Why have you no other wells?—Because it does not pay; the cost is so great.

24. Q. Do you recommend that Government should build wells for you and for others?—That would be very good, the people would like it.

25. Q. It would not pay Government any more than it would pay you?—In times of drought and scanty rain it would pay.

26. Q. Do you propose that Government should pay the whole cost?—No, advance the money without interest.

27. Q. And in what time should it be recovered?—In 10 to 15 annual instalments.

28. Q. If you sunk a well for yourself, do I understand you to say, that your assessment would be increased?—No, that practically ceased two to three years ago.

29. Q. In future there would be no charge?—Then the people would sink wells by taking takavi.

30. Q. If you could get advances, would you sink them?—One or two wells.

31. Q. What is your remedy for the Broach District?—Canals from the Nerbudda and Tapti would be best.

32. Q. In ordinary years you get more water than you want?—Yes.

33. Q. A canal from the Nerbudda would only be for dry years?—In dry years the water would do good.

34. Q. In the intermediate years you would not like to pay for it?—The rayats would pay something for the water.

35. Q. Supposing they did not want the water?—Even then they would pay something extra.

36. Q. Then they will want to take it?—Yes.

37. Q. They will in that case put too much water on the land?—No.

38. Q. What would they pay if they did not want it?—Re. 1 extra per acre whether they wanted it or not.

39. Q. What reason have you for saying that?—They want it for a crop every year and would willingly give Re. 1 per acre, if they water the crop they will get a 12-anna crop instead of a 6-anna one.

40. Q. Was there great loss of cattle in your district?—Yes.

41. Q. Due to what?—Want of fodder.

42. Q. Have you any recommendation to make for meeting that difficulty in the future?—Government should keep it in readiness.

43. Q. Why cannot you keep it yourself?—Government have reserve forests.

44. Q. What becomes of it now; is it cropped every year?—It is destroyed by fire now.

45. Q. Is it cut for the market every year?—No, it is simply wasted.

46. Q. Do you know if private contractors ever offered to cut it?—It would not pay in ordinary years.

47. Q. Therefore Government should do it?—Yes.

48. Q. It won't pay Government either?—No, it would not.

49. Q. In a famine year what should Government do?—Sell it to the people and they would willingly purchase it.

50. Q. But they would have no money then?—They would take takavi and purchase it.

51. Q. Supposing private contractors on waste lands were allowed to cut the fodder on low terms?—There is no great demand in ordinary years and so it would not pay.

52. Q. (*Mr. Muir-Mackenzie*).—Some of the land is *gorat* and some black soil?—Yes.

53. Q. Which requires most water for irrigation?—*Gorat* requires more water than black soil. In summer time black soil requires a lot of water on account of the cracks.

54. Q. Does not black soil run together and get sticky?—Not very sticky.

55. Q. In what soil are these wells of yours?—Partly in black soil and in *bsar* soil.

56. Q. There are fewer wells in Broach than in the Kaira District?—Yes, there are more wells in Kaira.

57. Q. That seems to look as if wells pay better in sandy than in black soil. Does tobacco grow in black soil?—Yes, if properly manured.

58. Q. Why have people not made wells in black soil as they do in *gorat*?—They have no means.

59. Q. The soil does not make any difference to their means?—Some people have made wells in black soil also, but they are very few; the expenses are greater.

60. Q. You are a member of the District Local Board?—Yes.

61. Q. I have understood that you have a great deal of influence with the people?—Some people think so.

62. Q. I remember you induced them to do a good many useful things, don't you think a man of your influence could induce the people to repair their tanks?—I could induce them if they had means.

63. Q. Have you tried?—Yes.

64. Q. Have you succeeded?—I succeeded in getting some portion of the taluka to give a subscription.

65. Q. Why could not you make the people do it themselves?—They are very poor.

66. Q. They gave money for the contribution?—The contribution is a small portion.

67. Q. Still in tanks where there is not much to do, could not they do it themselves?—Yes.

68. Q. They never do?—People cannot afford it, when a thousand or 500 are required, they could advance Rs. 10 or 15 but not more.

69. Q. No person of influence could induce the people to repair their tanks?—They are Government tanks and Government charges a water-tax, it is the duty of Government to repair them the people contribute one-tenth.

70. Q. Supposing Government remitted the tax, would the people repair the tanks?—Yes.

71. Q. A mamlatdar said in evidence that out of Rs. 6 assessment about six annas was tank assessment?—He was wrong; as far as I know the assessment is Rs. 4 to Rs. 5 per acre, and rice Rs. 10 to Rs. 15; that is the water-tax.

81. Q. What is the best thing to make that fit to be taken up for cultivation again?—Drainage. Mr. Jivanji.

82. Q. Some reduction of assessment would not be sufficient?—The assessment should be reduced besides having drains. 11 Dec. 01.

83. Q. Do you think any moderate reduction of assessment without drains would make the people take up these lands?—No.

84. Q. If a large canal were made through Ankleshvar taluka in the part of it which borders on the Keem river and the Nerbudda that that would be an excellent thing for the employment of labour; a great number of people would be employed?—Yes.

85. Q. Do a great number of people require employment?—Not in ordinary years.

86. Q. Have you difficulty in getting labour in ordinary years?—Yes, often.

87. Q. Do you get people to harvest your crops from a distance?—From six to ten miles.

88. Q. Not further?—No.

89. Q. In the Deccan people travel from 50 to 100 miles?—That is not the case here.

90. Q. Which would you rather see a canal or more roads?—A canal.

91. Q. Does not the District require roads very much?—A cart track would be better.



Mr. Simcox. These are matters of detail affecting but a few acres each. Still they ought to be done.

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Point 7.—I have seen a great many wells and advanced a great deal of money for them in the Malegaon charge. But I have no figures by me. I may be able to convey some information orally in a general way as to wells. It is my opinion that they are not so useful as bandharas where the latter are available. Well-irrigation is not suitable to the Maratha character. It takes too much time and labour. If he can get on with a dry crop he generally will not trouble to work the *mot*. But with a good pat he has only got to watch the water run. Hundreds of wells are deserted as soon as a famine is over.

Point 8.—I only know of one case at Patna, Taluka Malegaon. The water-logging is artificial. This is one of the small improvements I spoke of at the end of point 6.

Point 9.—The only remarks I could offer which would not better be made by Public Works Department Officers are as to village tanks and small road works in the Malegaon charge. I had 14 village tanks deepened in May and June 1900, and two small works to make roads good enough for country carts over passes where only foot traffic had previously existed. All these small works were successful in their objects. The tanks were holding water well, and were much appreciated by the villagers when I left. The pass roads were also a great convenience. These small works can be started in one form or another in most districts. The difficulty of supervision is that most felt. If a large establishment is appointed, it swallows up the grant for the work or a disproportionate part of it. I found that near Malegaon local gentlemen undertook the supervision of such works either for love or for their travelling expenses. The works were such as would benefit them and their neighbours, and there was a spirit of good fellowship which made matters easy. This could not, I fear, be expected in all districts. I should like to see the Chandkapur Tank and the Girna Left Bank Canal project completed. It has been hanging on for 25 or 30 years. I believe it would pay better than most similar projects. On the other points I do not anticipate that any remarks of mine would be of much value.

II.

A.—General.

1. The Malegaon Division of Nasik district. I was there five years and was impressed with the excellence of the pat-bandhara system and want to see it extended to other parts, my present charge (Satara) being one such part.

B.—Canals of Continuous Flow.

Preliminary.—I take it that what is meant by the above heading is what I should describe as "large canals," i.e., such as irrigate lands in many villages and whose course extends over many miles. The canals of which I am an advocate are such as only irrigate the lands of one village each as a rule. They originate in rivers near their sources which are dammed with masonry dams, and the canals are supplied with elementary head works which can be managed by the villagers themselves. The system is only applicable in the Deccan to the country within 50 or 60 miles of the Ghâts. Beyond this the rivers grow too wide and deep as a rule to admit of the economical construction of such dams. The typical river to exemplify the system is the Mosam which rises in Salher Fort and joins the

Girna near Malegaon—a course of about 52 miles. For over 40 miles of that distance it has a bandhara practically every $1\frac{1}{2}$ to 2 miles, sometimes closer. Out of the river at each bandhara flows a small canal or pat about 1 or $1\frac{1}{2}$ miles long, which irrigates village lands in varying quantities—ranging, so far as I remember, from 20 to 600 acres. The bandharas were in every case but one built in pre-British times. All that we have done is to improve the head works and to divert the channels in places where erosion was taking place. The cultivation in that part of the country has grown to be a fine art, and the crops produced are magnificent as a rule. But the system seems to be a purely local growth. True, one finds kachcha bandharas in most parts of the Deccan, but anything like the *pakka* bandharas of Nasik and Khandesh are very rare. The special points of the system appear to me to be (1) cheapness and (2) easiness of working. Once the dam and head works are put up, there are no expenses and no establishment required unless, of course, the dam be washed away or some such calamity happen. The irrigators are responsible for cleaning the pats and distributing the water. The dams themselves are not expensive, as they are erected only where the river bed supplies a good rock foundation. Such sites are available at frequent intervals.

7 and 8. The irrigation being ancient, there is no means of calculating the increase in yield or value of the land under pats. Drought does not affect them if the rivers and sites are well chosen. Malegaon has not had anywhere near its normal rainfall since 1896, but when I left last year the *patasthal* land was still doing well. The flow of the rivers was much reduced, it is true, but we cannot expect to have a recurrence of four or five years' drought.

9. (3) The pats all belong to Government. The rates varied from about Rs. 5 to Rs. 15 per acre. The last rate was that of a few villages near Malegaon. Dry land in them was assessed at Re. 1 to Rs. 2-8 per acre.

10. The system is that each irrigating village has one or more "patkaria" or "havildars," who are village servants responsible for distributing the water in accordance with the terms fixed by the village *panch*. These men receive remuneration, as other village servants do, as *watandars* in the shape of main land or cash allowances coupled with *haks*. For the annual silt-clearing and on other emergencies the Patil calls out all the irrigators to help.

11. There was no case of too profuse or extensive irrigation that I remember. The channels never went far from the river, and the irrigated lands generally drained themselves into the river to which there was a natural slope of the land. I only remember one case of water-logged land at Patna, Taluka Malegaon, of any extent. When I left I was trying to get the Executive Engineer for Irrigation, Khandesh, to remedy this by making a cut to the river.

I have put my remarks under B, because a properly placed bandhara should ensure a continuous flow. No doubt many of the pats in my former charge have been decidedly intermittent since 1898, especially those on the smaller tributaries of the Girna. But then the drought in that particular charge has been extraordinary. I may instance one village (not irrigated but within two miles of the river) where corn two feet high has not been grown since 1896. In such circumstances small streams must run dry. On the other hand, the pats on the Girna itself and most of those on the Mosam were working as usual.

1. Q. (The President).—You have had some experience of the Nasik district?—Yes. I was nearly five years in the Malegaon charge which adjoins this district.

2. Q. The country is similar to this district?—Very similar to Pimpalner taluka.

3. Q. Were you there right through the famines of 1896-97 and 1899?—Yes.

4. Q. Was the former the worse of the two famine years?—No, the latter was far worse. The number on relief in the latter famine was five times as large as that in the former.

5. Q. You are intimately acquainted with the bandhara system?—Yes.

6. Q. The system is peculiar to these parts?—I have never met it in such profusion elsewhere. I have never seen *pakka* bandharas elsewhere made by the people of old on their own account. There are *pakka* bandharas in other parts made by Government.

7. Q. Do you know the bandhara close here?—No. I understand it has a tank to feed it. The old *bandharas* had no tanks.

8. Q. Never?—No.

9. Q. The one referred to is a better sort of bandhara?—Possibly. The old bandhara were made simply by diverting the living stream. The Mosam River runs through the Malegaon charge for 50 or 60 miles, and at almost every mile there is a *bandhara*. Usually the only masonry work connected with each is the sluice at the head. Each *bandhara* as a rule supplies one village only.

10. Q. Does this river flow all the year round?—Yes.

11. Q. You say the bandhara supply only one village each?—As a rule, sometimes one bandhara supplies two villages.

12. Q. Mr. Gahagan said that some served more villages?—He may have been referring to the Panjhra River which runs through Pimpalner and Dhulia talukas.

The Pimpalner and Baglan talukas are not supplied by the same stream.

13. Q. Mr. Gahagan said there were disputes about the streams in various villages?—Yes, owing to short supply of water. For instance, I have known cases where the people of one village have unfairly heightened their bandhara by making mud dams on the top of the masonry. This gives them more than their fair share of water.

14. Q. The people on the lower course of the stream are jealous?—Yes. These quarrels are only common when the streams run low, and it should be remembered that since 1897 we have averaged only 11 or 12 inches of rain in the year instead of some 25.

15. Q. (Mr. Ibbetson).—Was there plenty of water in 1896?—Yes. At the end of July 1896 10 inches of rain fell in one day at Malegaon. This heavy fall filled all the streams.

16. Q. The streams went on running although there was no rain after July?—Yes.

17. Q. (The President).—We saw a lot of streams in Gujarat which do not flow all the year?—I do not know Gujarat. The rivers hereabouts have large catchments. To illustrate the amplitude of the water-supply in 1896 I may say that there is a small ditch which runs into the Mosam. Usually it is dry, but in 1896 it flowed all the year round and irrigated 200 acres. The people say that it flows only once in 12 years, in Sindhast year.

18. Q. Each bandhara has a canal leading down from it?—Yes. The channels are managed entirely by the villagers, except on rare occasion, e.g., when a channel is washed away by a flood. Then Government repair it. Ordinary repairs, such as silt clearing, are done by the villagers.

19. Q. Do you know how they manage the distribution of water? Have they any fixed plans?—They know their irrigated land thoroughly. The rotation is all cut and dry, and is known to the whole village. They have no occasion to refer to the Public Works Department in these matters.

20. Q. You say in your written evidence "The new bandhara at Kanasi, Taluka Kalvan, and the new bandhara at Morana Sandas, Taluka Baglan, were built during British rule?"—At Morana the Public Works Department built a new bandhara to raise the level of the canal. At Kanasi the old bandhara was ruined and was entirely rebuilt. The irrigating class had all left Kanasi, and new irrigators were brought in in my time and irrigation was recommenced.

21. Q. Did the new cultivators' ancestors live there?—No, they came from different parts of the country. I advertised the land to be given for irrigation through the taluka officers. Mr. Stewart really started the idea which was carried out in my time. The old villagers had all fallen into the hands of the savkars, who are Telis by caste, that is, oil-sellers. The savkars got possession of the land, but did not take the trouble to irrigate. The old villagers all left the village. In 1898-99 we offered the land free of occupancy price. A lot of people were collected from various parts of the district, but none belonged to the old population.

22. Q. The old bandhara was entirely ruined?—Yes. The new bandhara is a magnificent one.

23. Q. The people usually resent new bandharas?—Yes. There is generally much irrigation on each stream that there is little room for more. There is plenty of irrigable land, but the water in the stream will only irrigate a certain quantity. When a man buys up a piece of land adjoining the present irrigation, he often asks to be allowed to irrigate it. This can seldom be permitted, for the people generally know the limits of possible irrigation, and have already carried it as far as possible.

24. Q. Do you know whether at the tail end of the river all the water is used up?—The Commission is about to see the Jamda Canal, which is fed by the Girna River below all the bandharas.

25. Q. (Mr. Ibbetson).—You say all the bandharas take off above the Jamda Canal?—Yes. The Girna is a very strong-flowing stream. The great rivers such as the Bhima and Krishna dry up, but the Girna never.

26. Q. (Mr. Muir-Mackenzie).—Does the Krishna dry up?—Last year there was no stream running. I have seen the Godavari also dry, but the Girna always runs.

27. Q. The Girna runs through the Malegaon charge?—Yes.

28. Q. You say you want the Baglan system to be tried in Satara?—Yes, very much.

29. Q. Is there anything to account for the comparative failure of *kachcha* bandharas?—I have seen some such bandharas laboriously built of brushwood, stones and earth. In a few moments during a thunderstorm the stream may wash all this away and destroying all the work and rendering the expenditure useless. A fresh start is needed, and one season may entail great trouble and expense.

30. Q. You say "I think the streams might in some cases be increased in volume by the construction of storage tanks near the Ghâts." Is there any such project in existence?—Yes, the Chandkapur Tank.

31. Q. Is it in execution now?—I do not know. It is a very large project.

32. Q. If you increased the supply to the bandharas, would that increase cultivation?—Certainly.

33. Q. (Mr. Ibbetson).—Government would not get any return?—Certainly they would. Irrigated land near Malegaon is paying as much as Rs. 15 or 16 per acre.

34. Q. The water belongs to the land-owners in the villages and they dispose of it?—They have an immemorial right, subject to the payment of water-rate.

35. Q. How is the irrigation carried out?—If a village's lands measure 500 acres, perhaps 200 of that could be irrigated. The ideal farmer has a piece of unirrigated land, and a piece in each of the 3 divisions of the 'tal' or irrigated area. These 3 divisions are cropped in rotation with rice, sugarcane, and wheat or gram or other grain. The villagers manage very well among themselves so as to equalize the profits, for of course very few have land in all the divisions. Anyhow in three years all works out level; if a man has only one field he gets rice one year, sugarcane the next, and grain or pulse the third.

36. Q. Did the people raise any objection to the Chandkapur Tank?—No, but it was not carried out.

37. Q. (Mr. Muir-Mackenzie).—Was there any difficulty in carrying on the work during the famine?—Yes, owing to superstition. The people have a tale of a goblin having been killed in the river, which is supposed to make the water bad and the climate feverish. The people are very superstitious and when cholera broke out were convinced that the goblin was the cause. So they ran away. All the same, if these two reservoirs were constructed, they would do an immense amount of good.

38. Q. You mean the Chandkapur and Mulher reservoirs?—Yes, for both are on running streams.

39. Q. Are there such perennial streams in Satara district?—Yes. There are many streams near Satara with beautiful sites for bandharas, where there is rock foundation.

40. Q. (Mr. Ibbetson).—Perennial streams?—Yes, e.g., the Krishna in Vai taluka, which is perennial except in years of great drought, I could name others, but have not experience of all the streams in the district.

41. Q. The water in the channels is very scanty in May and June?—Yes, in most, but some are full all the year round. In others no sugarcane is grown as the supply is not certain in the hot weather.

42. Q. Do you know of any other places where tanks could be made besides Chandkapur and Mulher?—I know of some sites which seem good. Whether they would really be profitable is a matter for an engineering officer to decide. Mr. Ali Akbar went through the above two projects with me.

43. Q. You say "I have seen a great many wells and advanced a great deal of money for them in the Malegaon charge." Can you give figures?—I am afraid not. I had been transferred to Satara when I wrote that.

44. Q. You say "Well irrigation is not suitable to the Maratha character?"—That is what I have found as a general rule. Hundreds of wells were dug in the 1896-97 famine. In 1898 there was a good dry bajri crop. Hence the cultivators, having got enough to live on without troubling to irrigate, let their wells silt up.

45. Q. (Mr. Higham).—Those were *kachcha* wells?—Yes.

46. Q. Were those wells efficient?—Yes. In 1896-97 there was ample sub-soil water.

47. Q. Were they afterwards abandoned?—Not all, but very many.

48. Q. (Mr. Ibbetson).—Would you expect *kachcha* wells to be used for long?—Yes, with care. But as a rule, if there is a good season well irrigation is neglected.

Mr. Simcox.

14 Dec. 01.

- Mr. Simcox. 49. Q. Without making them pakka they would not last ?
—No, they would fill up in time.
- 14 Dec. 01. 50. Q. (Mr. Muir-Mackenzie.)—The expense of making a well *pakka* is not a small matter in times of famine ?
—Just so, it is not.
51. Q. What do you think is the cost of a *pakka* well ?
—A small well such as they make hereabouts might average Rs. 150.
52. Q. In Gujarat it costs from Rs. 750 to Rs. 1,000 ?—Here they make very small wells, generally for one or two mots only. As a rule they do not use chunam masonry except for the parapet. In Dabhadi village alone 80 wells were dug during the last famine.
53. Q. In 1899 ?—Yes.
54. Q. (The President.)—What area will each such well irrigate ?—As a rule from 1 to 2½ acres. But in 1899 the rainfall was very scanty and the sub-soil water very low. Also so many wells were dug that in parts there was practically a well in every field. The consequence was that the wells failed to irrigate more than ½ to ¾ acre. The complaint was that the soil was so dry that it drank up a great deal of water and the whole capacity of a well was needed to keep a very small area moist.
55. Q. What is the soil of the Malegaon charge ? Is it generally black cotton soil ?—In the valleys there is some black cotton soil, but as a rule the soil is shallow and mixed with *muram*.
56. Q. (Mr. Muir-Mackenzie.)—The irrigation under bandharas is not on black cotton soil ?—As a rule, no. The soil is often very poor stuff. It is very heavily manured. There are places where there is deep black soil, e.g., Kanasi.
57. Q. (The President.)—What about tanks in these talukas ?—There are a good many in the Malegaon taluka. They are village tanks.
58. Q. (Mr. Ibbetson.)—Not irrigation tanks ?—No, not one of them.
59. Q. (The President.)—They are small and for drinking purposes only ?—Yes.
60. Q. Are there no irrigation tanks in the charge ?—One, a Public Works Department tank.
61. Q. Is it far from any river ?—No, it is on the course of one.
62. Q. In Satara district there are a good many small rivers ?—Yes, and they have rocky beds in places suitable for making bandharas. The Krishna is practically a perennial stream, and so are several of its tributaries, on which bandharas might be built.
63. Q. There is no rule, I understand, to force the people to keep the irrigation in order ?—None, but their own interest.
64. Q. The Irrigation Department has a clause which compels the villagers to do ordinary repairs ?—Yes, but the villagers are not capable of anything but just keeping the channels in working order. In cases where, as at Saugameshvar in Malegaon taluka, the channel runs along the river bank, it sometimes gets washed away by floods. The villagers cannot be expected to rebuild it.
65. Q. In every *patashtal* village you have Inamdars connected with irrigation ?—Yes, they are called Patkaris or Havildars and are responsible for the distribution of the water.
66. Q. Inside their own village limits ?—Yes, they are under the orders of the Patil.
67. Q. (Mr. Rajaratna Mdlr.)—It is entirely a village distribution ?—Yes. It involves constant work night and day, for as soon as one field is watered the channel has to be diverted into the next.
68. Q. (Mr. Muir-Mackenzie.)—Have you had any complaints about unfair distribution ?—No.
69. Q. That is, no formal complaints ?—No.
70. Q. You have had petitions ?—Yes. The cause of complaint is easily removed. If one Patkari will not work we turn him out and put in another.
71. Q. Have you ever done that ?—Yes. They are subject to the Watan Act. If they do not perform the service of their Watan, they are liable to be turned out.
72. Q. (Mr. Higham.)—You are speaking mainly of bandharas in the north-east part of Nasik District ?—Yes.
73. Q. You say they do not require any storage reservoir ?—As a rule they work very well without, but the reservoir would make the supply more even.

74. Q. Distant villages would get but little benefit from them ?—I do not say that.
75. Q. The main object of the Chandkapur Tank would not be to ensure the present irrigation ?—No, the main object is to fill the Girna Left Bank Canal which would irrigate a dozen new villages, including a little patch of country which has had no rainfall for six years.
76. Q. (The President.)—No rain for six years ?—They have not had enough rain to bring bajri to ripeness since 1896.
77. Q. (Mr. Higham.)—The Girna eventually flows down to the Janda Canal ?—Yes.
78. Q. Is the Chandkapur project a big scheme ?—Yes.
79. Q. It involves the construction of bandharas at frequent intervals down the river ?—Yes, but there is only the initial expense. There is but little recurrent expense for establishment.
80. Q. (The President.)—The sites and remains of some of the old bandharas exist and would be used ?—Yes.
81. Q. (Mr. Higham.)—There are bandharas already working in some parts ?—Yes.
82. Q. Suppose you build a bandhara and take water along a channel, could you not irrigate more than one village ?—Yes. I suppose it could be done.
83. Q. Could you give an instance of such a system already working ?—No. I do not know of a case.
84. Q. If you wanted to take the water further out into the country, your works would have to be larger ?—Yes.
85. Q. (The President.)—What prevents the water going further ?—The levels.
86. Q. (Mr. Higham.)—I suppose the same system obtains on the Mosam ?—Yes.
87. Q. What is the length of the channels ?—From 1 to 4 miles.
88. Q. (Mr. Ibbetson.)—Are there aqueducts in and cases ?—Only where the Public Works Department have built them to improve the channels, e.g., at Kanasi and Kalwan.
89. Q. When you speak of 20 or 30 bandharas in 40 miles, how do you distribute the supply ?—Is it enough for all ?—Yes, as a rule during the last few years the rainfall has been extremely scanty and difficulty is being felt.
90. Q. Each bandhara takes as much water as it likes ?—Yes.
91. Q. At the bottom of the irrigation the overflow get back to the river again ?—Yes.
92. Q. If there were storage tanks you would get a greater flow ?—Yes, that was Mr. Ali Akbar's idea. He said that if the Mulher Tank were built the Mosam would be quite safe from failure.
93. Q. The scheme was not passed ?—It had not been fully prepared. Mr. Gahagan can tell you whether it has yet been sanctioned or no.
94. Q. (Mr. Higham.)—If the tank always provided water you would be better off than at present ?—Yes. Among other things the drinking supply of Malegaon town would be assured.
95. Q. If a storage tank existed, would more bandharas be built ?—Not on the Mosam.
96. Q. When the supply ran short, how did you settle the disputes ?—The people generally settled them among themselves. In one or two cases there were quarrels, but this was the exception.
97. Q. I was not referring to distribution within a village. I was speaking of the distribution between your 40 bandharas. The bandharas down the stream would get no water in a bad year ?—But they did get it.
98. Q. Did they get water in the last bad year ?—Yes certain amount. The best bandharas of all is at Nampur about half way down. The river there always runs.
99. Q. Do you put any restrictions on the upper bandharas, or allow them to take what they can get ?—They take what they can get.
100. Q. They are not allowed to enlarge their sluices ?—The sluices are *pakka* and made and repaired by the Irrigation Department. I do not know what was done before that Department came into existence. I suppose there was some *kachcha* arrangement.
101. Q. They take as much water as they can get ?—Yes.

102. Q. The Chandkapur Tank in your opinion should be worked on an identical system?—I believe so.

103. Q. Under that system the bandharas down the stream would get an unfailing supply of water?—Yes, not only so but the Girna Left Bank Canal would be filled.

104. Q. Why did Mr. Ali Akbar propose this canal instead of a succession of more bandharas?—Bandharas to pay should be capable of being built cheaply. There are few suitable sites on the Girna, which is a broad stream with steep banks and sandy bottom. Bandharas can only be built cheaply where there is a rock foundation. But Mr. Ali Akbar proposed not only to make the canal, but to extend irrigation under each of the existing bandharas. As to the Mulher scheme, that is to ensure the flow of the Mosam, which is not so safe as the Girna. While it does not run quite dry, still the supply is often too little for sugarcane crops, and the assessment is based on a rotation including sugarcane.

105. Q. You would intercept the stream by bandharas at every village and still have enough water?—I speak of Mr. Ali Akbar's scheme as I found it.

106. Q. (*The President.*)—You think it a good one?—Yes.

107. Q. (*Mr. Higham.*)—You think small canals are preferable to large?—I think they are worked cheaper. Without going into details, I believe that in the Deccan the working expenses of a large canal generally eat up all the profits.

108. Q. Would not these people make bandharas themselves?—It is a matter of prohibitive expense to them. A small bandhara is estimated to cost at least Rs. 5,000.

109. Q. If you get this Girna canal, I suppose you will have to introduce a water-rate?—Certainly.

110. Q. On the present bandharas you have wet assessment?—Yes.

111. Q. It depends on the area irrigated?—No, it is a permanent acreage assessment on the area irrigated which does not vary.

112. Q. You calculate that a bandhara will irrigate so many acres?—No, the area has already been fixed by custom. The land is assessed at a dry rate to which is added a wet-rate according to the crops to be grown, and the two lumped together are the assessment.

113. Q. It does not fluctuate?—Not in the permanent irrigation. In the case of small streams of uncertain flow, where water is only occasionally taken, there is a fluctuating rate called *pankasar*.

114. Q. This assessment is paid annually?—Yes.

115. Q. Whatever the area irrigated?—Yes, but in practice the full area is always irrigated.

116. Q. If they take more water than they want, what happens?—It flows back to the river.

117. Q. Do they never use the overflow to surreptitiously irrigate extra land?—Sometimes, but the people below soon find it out by the short flow, and stop it.

118. Q. As a matter of fact, little extra irrigation takes place?—Very little.

119. Q. If the Chandkapur scheme is carried out and you increase the irrigation, how will the land be assessed?—Presumably on the old lines. There will be a little friction at first. I have talked the matter over with villagers, who protested that there would never be enough water to go round.

120. Q. Are people eager to get irrigated land?—They take it greedily. I used continually to be bothered with applications from cultivators below the existing irrigation asking for permission to irrigate. I used to refuse, for the people on the next bandhara below would be certain to raise quarrels, and even if there were enough water, would make out that they were being defrauded.

121. Q. If you had a storage reservoir?—Then I would give permission freely, and objections would soon cease.

122. Q. Would the people consent to wet assessment?—Why not? It is the system they know.

123. Q. You have a system of village distribution?—Yes.

124. Q. Of which the village headman is the controlling power?—Yes, the Patil.

125. Q. Supposing the Patil tries to get more than his share?—He has his fixed share, he can get no more.

126. Q. He cannot get more than his share of irrigation, but could he not get more than his share of water?—I should think perhaps sometimes.

127. Q. Have you had complaints of that sort?—Never formal complaints. *Mr. Simeon.*

128. Q. How is the distribution done?—By the Havildar or Patkari. *14 Dec. 01.*

129. Q. Does he attend the field to give enough water and then shut it off?—Yes.

130. Q. Is there a regular time fixed? No. When one field is irrigated he goes on to the next. He is not allowed to irrigate half a field and then go on.

131. Q. They trust his discretion as to when the water is to be turned off?—The cultivator is generally present, and it is done by experience. I think the system is a very fair one.

132. Q. Is there any royalty charge for water?—Yes, for occasional irrigation, according to the amount of land irrigated. The Mamlatdar sends out a man to assess it.

133. Q. Under what authority?—The Land Revenue Code.

134. Q. Under the Land Revenue Code can you charge a royalty?—Yes; all running water is the property of Government. All beds of streams are also the property of Government.

135. Q. If a man takes water you charge him royalty?—Yes. It is called *pankasar* or water-rate.

136. Q. It is not a charge for water but for increased produce?—No. It is not for increased produce, but for irrigation per acre.

137. Q. The water is the property of Government?—Yes.

138. Q. (*The President.*)—The man is charged by the number of acres he irrigates?—Yes, at so much per acre.

139. Q. The assessment is for the advantage of getting the water?—Yes.

140. Q. (*Mr. Higham.*)—Is there a fixed scale of rates?—Yes.

141. Q. It is not uniform?—No.

142. Q. (*Mr. Ibbetson.*)—Does it vary according to the locality or crop?—According to both.

143. Q. (*Mr. Higham.*)—Has the Irrigation Officer the right to close part of the irrigation under a bandhara?—No.

144. Q. Supposing the people quarrel, or take more than their share?—There are cases where orders are issued that a certain channel shall be closed for a number of days in a week for the benefit of the next channel below. These orders are based on old custom, e.g., the Vadner bandhara is allowed to take water for five days in the week, and for two days it has to let the water run down to the Khakundi bandhara.

145. Q. Are such orders disregarded in any case?—Frequently, but I have generally been able to patch up the disputes, but few went to the Collector.

146. Q. Supposing they disobeyed your orders, could you shut off the water?—I don't know whether I should have legal authority to do so.

147. Q. You have never done so?—No.

148. Q. (*Mr. Ibbetson.*)—Have you authority under the Land Revenue Code to settle disputes about the distribution of water between the different channels?—I don't know, we always managed it by friendly arrangement.

149. Q. You really settled such disputes by your influence?—Yes.

150. Q. Have you any legal authority to settle such disputes?—None that I know of.

151. Q. You were not able to settle them because you had certain powers, but because you had influence over the people?—Yes.

152. Q. You say the people are reasonable and therefore the system works well hereabouts?—Yes.

153. Q. You propose to extend it to Satara?—Yes.

154. Q. Do you think the people of Satara will take to it?—I could not say.

155. Q. (*Mr. Muir-Mackenzie.*)—I think there is some hope. The people in Javli taluka and down the Vena River are irrigating in this way?—Yes, on a very small scale.

156. Q. (*Mr. Ibbetson.*)—In Gujarat we were told that it is hopeless altogether to get the people to combine to clear out small tanks. Is that the case in Satara?—I should think probably it would be the case if an attempt were made.

Mr. Simcox. 157. Q. Do you think that there should be legislation in order to give the Collector or other Revenue officer authority to settle disputes and enforce the responsibility of silt clearance, etc.?—It might have to be done if the irrigation is much extended. It is not now necessary in this part of the country. I do not know how things would work in Satara.

158. Q. Were these bandharas made by the people themselves?—No body knows who made them, they are very old.

159. Q. In extending the system to Satara, do you propose that the people themselves should make them?—I do not think so.

160. Q. Will Government have to make them?—Yes.

161. Q. Looking at it purely as a commercial matter, do you think it would pay Government?—I believe it would.

162. Q. The area irrigated would more than pay the interest on the cost?—Yes.

163. Q. Would there be no working expenses?—Hardly any. I do not think the district would need a separate irrigation establishment, the Executive Engineer would probably be able to work the system.

164. Q. You say that in 1896 irrigation from bandharas was reduced. Do you know in what proportion?—In 1896 I should say it was rather increased than decreased. In 1899 it may have been diminished by 25 per cent., so that only $\frac{3}{4}$ of the normal area would be irrigated.

165. Q. Not more?—I have no figures, but I should not think so.

166. Q. (*Mr. Muir-Mackenzie.*)—Do the people in a famine year not change the character of their cultivation and grow fodder crops?—They do grow fodder in the hot weather, mostly *konde* a kind of *juari*. The hot weather crop is usually sugarcane, but that needs a great deal of water more than is available in bad years.

167. Q. Do they also grow rice, wheat, and gram?—Yes, in and after the rains.

168. Q. Do the Satara people appear to take any interest in the bandhara system?—I was speaking only a day or two ago to an influential resident of Satara, who is now a candidate for the Legislative Council. He suggested that bandharas should be built on a co-operative system, and wondered whether, if private persons subscribed part of the capital, Government would produce the rest.

169. Q. (*The President.*)—Is he a man of means?—Yes, he is the leader of the local Bar, and it was evident to me that he only spoke after disussing the subject with others.

170. Q. (*Mr. Ibbetson.*)—In that case Government would only take a royalty on the water?—No, system has been elaborated. I only mention the matter to shew that intelligent natives are taking an interest in the matter which apparently amounts even to a readiness to invest their money.

171. Q. You say you have small tanks in the Malegaon charge for drinking, why should there not be larger tanks?—There is one large Public Works Department tank on the Passul River in the charge. It ran dry when it was most wanted in 1899, and no irrigation from it was possible.

172. Q. If you have plenty of drinking tanks, why should you not have plenty of irrigation tanks?—There are no sites good enough.

173. Q. There are sites for the one and not for the other?—Yes. The village tanks are made by damming up insignificant nallahs, and soon run dry.

174. Q. Could rice be grown under them in the cold weather?—I think not.

175. Q. It has never been tried?—No. In the case of the Dapura Tank near the Khandesh frontier, which Mr. Ali Akbar and I saw, he agreed that after extensive repairs and improvements it might be possible to irrigate a few acres.

176. Q. Is there any system of canals by which such tanks might be made useful?—No.

177. Q. Were one possible, it would have been brought into use?—Probably.

178. Q. You never suggested such a thing?—No. The country is all rocky moorland or upland with very scanty rainfall. The village tanks are useful for drinking and for getting a little head of water for wells below.

179. Q. There are wells then?—Yes.

180. Q. What happened in the famine year?—Most of them dried up. There was not enough rain to fill the tanks, which dried earlier than usual. There were cases where whole villages emigrated on account of want of drinking water.

181. Q. (*Mr. Rajaratna Mdlr.*)—Can you tell us the area these bandharas irrigate in each district or taluka?—It varies much according to the soil, flow of water, and level of the land.

182. Q. What is your present area of irrigation?—I have no figures.

183. Q. When you were in charge, what was the area irrigated?—I would not say off-hand.

184. Q. Are the bandharas now irrigating a larger area than of old?—I think not. The whole system is very old and seems to have been worked to the full capacity of the water from old times. The people have an instinctive sense of the possibilities of irrigation. I do not think they could irrigate more than they do. The instinct has become hereditary through many generations. They are clever cultivators and their land is well farmed.

185. Q. If new bandharas were built elsewhere, do you think the people would not combine and co-operate to keep them in repair?—If the system were to be tried in a new part of the country where it is not understood, I should prefer that one or two bandharas be made first as experiments, to see if the system would work.

186. Q. Would you substitute a small cess in lieu of a contribution for labour for petty repairs?—I could not say. A free hand as to details ought to be given in trying the system, or it ought not to be tried at all.

187. Q. Referring to the Chandkapur scheme, would its construction interfere with existing bandharas?—Quite the reverse.

188. Q. The higher the water level, the further extension of irrigation possible?—Yes.

189. Q. (*Mr. Muir-Mackenzie.*)—I think Mr. Rajaratna asked you whether it would be preferable to substitute a small cess for a contribution for labour. Do you approve of such a cess in the existing bandharas?—No, the present system is working well.

190. Q. (*Mr. Rajaratna Mdlr.*)—You cannot give the figures of revenue from existing bandharas?—Not now. I could find them out, or Mr. Gahagan could give them.

191. Q. (*Mr. Muir-Mackenzie.*)—Do you consider that the present system of assessment by consolidated rate works on the whole satisfactorily?—Yes.

192. Q. You would not like to see a crop-rate substituted?—No. The present system is good for people who pull together as these do. For instance, one man's land will be under sugarcane, which pays the best, a second's under rice, which pays moderately, and a third's under gram or wheat, which pays the least, according to the rotation. Yet their circumstances seem all alike, and no doubt they have some system of pooling profits.

193. Q. (*The President.*)—Do they take equal shares.—They come to some friendly arrangement.

194. Q. (*Muir-Mackenzie.*)—Do they lump all the cultivation together?—I should not go as far as that. These arrangements are never made public.

195. Q. (*Mr. Higham.*)—What is the proportion of dry land cultivated to irrigation?—Ten bighas of dry land to one of irrigation is supposed to be the ideal proportion—not often attained.

196. Q. (*Mr. Muir-Mackenzie.*)—Does rice pay as well as sugarcane?—Not so well, but it is a paying crop.

197. Q. Do you know how the relative values are calculated of the two for the purpose of assessing the rate. Is it half rate for rice, whole rate for sugarcane?—I do not know the exact proportion.

198. Q. Would it be 16 to 6?—I should think 16 to 10. Baglan rice is of very good quality. I always used to get it sent to Satara.

199. Q. What happens to the surplus water from bandharas?—Down the nearest nallah to the river again. The people of Bagder, for instance, who live near such a nallah below the irrigation of Bej in Kalvan taluka, wish to dam this nallah and thereby establish a channel of their own.

200. Q. Is there subterraneous percolation below the limits of the irrigation?—I believe usually.

201. Q. Were any wells dug in such land during the famine?—Yes, several.

202. Q. Were they successful?—I believe so, I know some were so near the Satara irrigation.

203. Q. Do you think such sites for wells were chosen purposely?—No doubt.

204. Q. The multiplication of *bandharas* would then not only be useful for irrigation, but to keep up the level of the subsoil water?—Yes.

205. Q. You were saying that some of the land irrigated is black soil?—The deepest black soil is at Kanasi.

206. Q. Could you tell us how deep the soil actually is and when *muram* is reached?—It is at least 6 feet deep, probably more. I have never seen it dug up deeper than 6 feet.

207. Q. Is it absolutely pitch black?—Yes, it is a rich soil. The rainfall there is too heavy for cotton to be grown, but I imagine the soil is like the black cotton soil of Gujarat.

208. Q. Does black cotton soil require a great deal of water?—I have not heard of its needing more than any other.

209. Q. What is the land at Satara?—Black soil nearly 6 feet deep with *muram* at the bottom.

210. Q. We have been told that black cotton soil is unsuited for irrigation?—Such is not my experience.

211. Q. Do not people complain of the "sickness" of black cotton soil?—No. In Kanasi where the soil is deepest, there has been no real trial. I mentioned above that the village was only just being repopulated.

212. Q. You distributed a large amount of *takavi* in 1899-1900?—Yes.

213. Q. A great deal of the distribution was done with your own hands?—It was all done by my cheques.

214. Q. Were you impressed with the efficiency of the arrangement by which Assistant Collectors distributed *takavi* personally?—Do you think it made the people more ready to take advances?—I do not know. My reason for personal distribution was that one *Mamlatdar* works quicker than another. The quickest man, if left to himself, would get an unfair proportion of the grant for his taluka.

215. Q. Do you think that Assistant Collectors would have time for personal distribution in ordinary times?—Certainly, because then the demand is not large. In famine times it is right hard work. For instance, on one day at Malegaon I had between 1,000 and 1,200 persons present *takavi* petitions to me.

216. Q. What is the cost of digging a well in the Malegaon charge?—For a well dug and built complete, I should say about Rs. 250 on an average.

217. Q. (Mr. Ibbetson)—Allowing for what depth of water in the well?—About 8 feet.

218. Q. And the total depth of the well?—About 30 or 40 feet.

219. Q. You include the building of the well?—Certainly.

220. Q. (Mr. Muir-Mackenzie)—Did the building of wells during the famine lead to a larger area being irrigated?—In 1896, yes—in 1899, no, as the water was so low.

221. Q. Why so?—In 1896, though the rainfall was not timely, we had more than the average.

222. Q. What is usually grown?—Wheat, gram, vegetables and fodder crops.

223. Q. Are the people keen about *takavi*?—There is little demand in Satara district. Lately, in the cold weather, I have been having a petition about once a week. This being the well digging season, if there were any real demand there would be hundreds of petitions.

224. Q. Do you think any alteration of the system will bring about any improvement?—No.

225. Q. It is no use lowering the interest?—People do not mind the interest, they only object to the rigidity of the collection of instalments.

226. Q. Would it stimulate extension of *takavi* in ordinary times if the collection of instalments were made more elastic?—I don't think so.

227. Q. You do not think that would make them dig more wells?—No. If they want to dig wells in ordinary times they go to the *Savkar*.

228. Q. Do you mean to say that if Government increase the facilities for getting money, the people cannot be induced to dig more wells?—There is no harm in trying but I think not.

229. Q. (Mr. Ibbetson)—Is terracing done in your charge?—In Satara there are a great many terraces.

230. Q. Do you think famine labour could be profitably employed on terracing?—I had not thought of it. I should say famine labour might be so employed in hilly country.

231. Q. (The President)—You say that near Malegaon each village has its own *bandhara*?—Yes.

232. Q. Is there any village with two *bandharas*?—Very few. For instance, at Arai there are two, one worked by Government and one by an *Inamdar*. The water suffices for both.

233. Q. Is any *bandhara* the joint property of two villages?—Very few.

234. Q. If a dispute occur in a village, to whom do the disputants apply?—I know of no rule. In one case they telegraphed to the Collector of Nasik.

235. Q. Does any appeal lie to the High Court?—I could not say.

236. Q. (Mr. Ibbetson)—Could you tell us anything about the liability of the Satara district to famine and scarcity?—About 40 miles from the Ghats the land is very rocky and subject to drought. The taluka of Man is very subject to famine. But in the Ghats near Mahabaleshwar there is always ample rainfall. The central part of the district is only partially subject to famine, if at all.

237. Q. When you say the eastern part is subject to famine, you refer to the country bordering on Sholapur and Bijapur?—Yes.

238. Q. Does that cover a considerable area?—Yes, quite one-third of the district.

239. Q. The other two-thirds is secure?—Yes. A large portion near the Ghats is taken up with forest.

240. Q. For *bandhara* irrigation you prefer a consolidated to a crop-rate?—Yes.

241. Q. You consider the former more advantageous?—Yes.

242. Q. Why?—It is what the people are accustomed to, and they are always ready to pay it.

243. Q. If we made new *bandharas*, would there be some disappointment if we introduced a water assessment?—Yes. The people are thoroughly conservative, and would certainly raise quarrels over any new system for the first few years.

WITNESS NO. 42.—MR. E. G. GAHAGAN, Executive Engineer, Khandesh Irrigation.

Answers to printed questions.

A.—GENERAL.

1. The replies refer to the Khandesh Irrigation District, of which district the writer has been in charge rather less than twelve months, during which time he has seen little of a large district, as he has had a very short touring time, and his opportunities have unfortunately not been such as to make him thoroughly acquainted with it in a short time.

2. See Appendix I.

3. (1) Yes, in places, e.g., in the Upper Panjhra Sub-division the population by the last census is about 56,000 and the area of culturable ground near 200,000 acres.

(2) No.

(3) No.

(4) No. There is black cotton soil in a great many places, but on the whole the soil is very good.

(5) No. Just lately the unfavourable monsoons have had some effect, but ordinarily there is no reason why the quantity of water should be considered to be insufficient and tell against extension of irrigation.

(6) No. The people are keen on irrigation and can generally find the capital necessary.

(7) I have not very much knowledge of this, which is a question for the Revenue Department, but from what I

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can gather in several parts given a certain supply of water, the people (generally speaking) would not mind even a slight enhancement of assessment.

(9) There is a chance if irrigation were increased that the price of labour would rise, this though is hardly a reason against extension of irrigation although it would increase the expenditure of the agriculturists.

5. Loans are not, as far as I am aware, taken for extension of irrigation from canals, but are freely taken (if the applicant can give the required security) for the purpose of well digging or deepening so as to extend cultivation under this form of irrigation.

(4) If there is a failure to get water, there should be, I think, a total remission of the advance, but I would suggest Government using drilling or boring machinery to a far greater extent than at present to try and make sure of whether water is obtainable or not before actual well digging is attempted.

6. I should think not, and have never heard of such having happened. In this district there is a very strong desire, and a very general desire for extension of irrigation. The people are naturally agriculturists, and are very anxious for an increase.

B.—Canals of continuous flow.

7. (1) The system of irrigation in this district is the "Thal" system, that is, the whole "Thal" or "village land under cultivation" is divided into four "Phads," each of which is cultivated in rotation with a different crop, e.g., one Phad has sugarcane one year, the next has rice, the third wheat and the fourth, say, bajri, tili and other crops. Next year the one that had sugarcane will have rice, the rice plot will have wheat, and so on. Each of the sugarcane, wheat and rice crops can only give one harvest a year, but the fourth "Phad" gives two harvests yearly. So one-fourth the land always gives two harvests.

(2) The increase in the value of the crops is very considerable, as the value of crops grown is very much greater than it would be otherwise. If the more valuable crops, e.g., sugarcane, wheat and rice were not grown, two harvests could be had in each Phad every year. This, however, would not pay so well.

(3) (a) In a year of good rainfall rice and sugarcane would not give the same yield without canal water, as with, in fact, it is doubtful whether they would come to anything at all. Wheat and the other crops would probably be as well off in a good year without the canal as with it.

(b) In a year of scanty rainfall the yield is considerably increased.

(c) The same, only more so.

8. A statement showing the comparison of net profit from the crops grown in an unirrigated field and an irrigated field of one acre in area is attached. The yield of the former is given for one year only; and the yield of the latter for four years is taken into account, and an average for a year is struck. This shows that an irrigated field produces crops of the average value of Rs. 65, at an expense of Rs. 28, leaving the net profit of Rs. 37; against, in a non-irrigated field, produce of the value of Rs. 18, at an expense of Rs. 4, leaving a net profit of Rs. 14 only. In ordinary years, therefore, an irrigated field of one acre pays three times the income of an unirrigated plot of land. In a year of drought the unirrigated plot would give no yield whatever, whereas the cultivation of an irrigated plot would pay the owner at least Rs. 22, if not more. There is, how-

ever, no reason why the value should not be more owing to the high prices of grain which then prevail.

D.—Tanks.

23 to 33. It is presumed from the questions under this head that small tanks, such as village tanks, etc., are meant. None of these exists in this district, so I can say nothing on these questions.

E.—Wells.

34. See Appendix II.

35. (1) Wells allow of two harvests being grown instead of one, one by monsoon and one by irrigation from the wells. This, of course, is provided, none of the high valued crops are grown, e.g., sugarcane and rice.

(2) In this district higher rated crops are not grown under wells.

(3) (a) In a year of ample rainfall wells are hardly if ever used.

(b) In a year of scanty rainfall wells are very useful for supplementing irrigation from canals when canal water is short, and for supplementing monsoon water by helping to water Jirayat crops.

(c) In a year of drought if they have water (which they generally have, as they do not run dry till the next year), they are very useful.

38. (1) Serious difficulty in selecting a spot for a well is not as a rule encountered in this district. The people consult their neighbours, and take into account the general nature of the surroundings, and are generally successful. They rarely if ever now call in the assistance of "water diviners," though I have known cases in which the aid of the latter was called in with very poor results for the man who paid.

(2) In the actual construction of the well there is no difficulty.

As far as I know no assistance has been offered by Government or Local Bodies in the shape of advice or use of boring tools, etc., in this district, although it has in others and I have myself tried them. I would strongly recommend the further use of boring tools which should be supervised by experienced men, and a small charge made when a spot with water was found.

39. I do not think Government should build wells in private property. The people are just as well able to do it for themselves, and as they would not have the heavy establishment charges to incur which in Government work so adds to the cost, they would get it done cheaper. Their work would not have the finish that Government work would, but it would be just as useful. Government ought to advance the money, after finding a spot by boring, and then let the owner work the rest in his own way. In addition, if Government built the wells, they would want some return either in a lump sum or as a yearly rental, and the cultivators would not care to be bound down to anything like this, as they could never be certain of a supply of water, nor of the means of lifting it, as they are never very certain of what their condition will be in future years, nor whether they would even require the water, if the rainfall should be exceptionally good.

40. Temporary wells are very rarely used in this district, nor does it appear necessary to encourage their construction. I have little knowledge of them myself, but from information gathered from many sources this is what I learn.

APPENDIX I.

Statement showing the average Rainfall in each month as gauged at the following Stations.

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Months.	STATIONS.										
	Irrigation Office at Malegaon	Mukti Tank.	Jamda.	Mhaswa.	Hartala.	Parsul Tank (Umrana).	Sakri.	Dahival.	Amli.	Pankheda.	Lakhula.
	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.	In. cents.
January .	0 1	0 5	0 15	0 18	0 32	...	0 5	0 2	0 16	0 10	0 19
February .	0 2	0 2	0 25	0 12	0 6	0 2	0 3	...	...	...	...
March .	0 9	0 6	0 3	0 9	0 13	0 1	0 1	...	...	...	...
April .	0 9	...	0 12	...	0 5	0 1	0 6	...	...	...	...
May .	0 69	0 4	0 23	0 36	0 74	0 42	0 65	0 8	0 4	0 10	0 2
June .	3 51	3 51	4 57	4 94	3 82	4 49	5 40	5 2	5 87	6 9	8 27
July .	4 60	6 11	5 67	7 50	7 64	4 63	5 6	7 94	12 2	9 77	20 97
August .	3 51	3 81	5 23	6 69	6 2	1 99	3 18	5 52	9 56	7 57	12 56
September	6 99	5 73	7 45	5 84	6 99	6 63	4 1	3 52	5 11	4 52	7 63
October	1 19	0 45	0 63	0 90	1 38	1 1	1 55	1 88	9 57	2 19	1 83
November	0 24	0 27	0 27	0 14	0 7	0 27	0 41	0 72	0 58	0 95	0 96
December	0 2	0 1	0 4	0 7	0 9	0 6	0 2	...	...	...	...
TOTAL .	20 96	20 6	24 69	26 83	27 31	19 54	20 43	24 70	42 91	31 29	52 43

APPENDIX II.

E.—Wells.

	Upper Panjhra.	Shahada Sub-division.	Dhulla.	Jamda Canals.	Malegaon.
34. (1) Average depth of wells.	20' to 30'	30'	30'	40' to 50'	25' to 30'
(2) Nature of supply .	Percolation .	Percolation .	Percolation .	Percolation .	Percolation.
(a)	Do not fail in ordinary year.	Do not fail in good years.	Do not fail .	Do not fail .	Do not fail in good years.
(b)	Fail in years of drought sometimes, but generally the year after.	Some fail in years of drought.	Some fail in bad years, most year after the drought.	Yes, some fail .	Some fail in years of drought.
(3) Average cost .	Cost from Rs. 150 to Rs. 250.	Rs. 300 to Rs. 400.	Rs. 150 to Rs. 250	Rs. 100 to Rs. 150.	Kachcha wells Rs. 50 to Rs. 70, Pakka wells Rs. 150 to Rs. 200.
(4) Average duration .	Pakka built said to be 100 years.	Pakka about 100 years.	100 years .	100 years .	Kachcha wells last for 5 years, Pakka 100 years.
(5) Manner of lifting water.	Lifted by mots .	Mots .	Mots .	Mots .	Mots.
(6) Average area commanded.	15 to 20 acres commanded.	16 acres .	15 acres .	12 acres .	15 acres.
(7) Average area irrigated in any one year.	3 to 5 acres .	3½ „ .	2½ „ .	4 „ .	6 „
• Annual cost of repairs.	Rs. 5-10 .	25 to 30 .	Rs. 3 per year .	Rs. 10, including repairs to mots, etc.	Rs. 5 to Rs. 10.

Mr.
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Statement showing the estimate of the increase in value of the produce in an acre of irrigated Thal land over that in unirrigated one.

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YEAR.	CROP.		GROSS VALUE OF CROP RAISED IN RS.			EXPENSE, INCLUDING THE COST OF CULTIVATION AS REGARDS THE BULLOCK'S AND CULTIVATOR'S OWN LABOUR.						Net Profit.	
	Kharif.	Rabi.	Kharif.	Rabi.	Total.	Government assessment.	Manure.	Seed.	Weed- ing.	Press- ing charges.	Total.		
							Bagayat crop estimate.						
1st year .	Bajri or til	Wheat, gram or pea.	18	17	35	8	...	3	2	...	13	22	
2nd „ .	Rice .	...	35	...	35	8	...	3	2	...	13	22
3rd „ .	Sugarcane	...	150	...	150	8	20	12	10	25	75	75	
4th „ .	...	Wheat, single crop.	40	...	40	8	...	3	2	...	13	27
			243	17	260	32	20	21	16	25	114	146	
Average per year.	...	...	...	...	65	...	...	...	...	...	28-8	36-8
							Jirayat crop estimate in irrigated Thal land.						
Every year .	Bajri or til	...	18	...	18	1	...	1-8	1-8	...	4	14	

Statement showing works executed by Relief Labour in the Khandesh Irrigation District as per paragraph 9 of the Irrigation Commission Notes.

Serial Number.	Name of Work.	EXPENDITURE.		REMARKS.
		On each work.	On each class of work.	
	I.—ROADS.			
	<i>Provincial.</i>			
1	Improving the Ghorda-Kondaibari Road	46,374		
2	Constructing a road from 52 miles on the Dhulia-Surat Road to Visarwadi.	11,715		
	<i>Local.</i>			
3	Constructing Shahada-Taloda Road	32,760		
4	Do. a road from Visarwadi to Chinchapada Railway Station.	39,787		
			1,30,636	
	II.—ROAD METALLING.			
	<i>Provincial.</i>			
5	Metal Collection, Dhulia-Surat Road	89,481		
	<i>Local.</i>			
6	Metal Collection, Dhondiacha-Shahada Road	15,512		
7	Do. Songir-Nandurbar Road	87,053		
8	Do. Taloda Nandurbar Road	34,287		
9	Do. Sakri-Pimpalner Road	7,793		
			2,34,126	
	IRRIGATION WORKS.			
	<i>Imperial.</i>			
10	Constructing Chankapur Tank	43,875		
11	Do. Purnapada Tank	2,06,135		
12	Do. Talwada Tank	1,00,826		
13	Do. Raipur Tank	48,217		
14	Silt clearance, Jamda Canals	23,727		
15	Do. of Irrigation Channel on the Kan River.	1,070		
	OTHER WATER STORAGE WORKS.			
	<i>Municipal Works.</i>			
16	Improvements to water-supply at Jalgaon	74,951		
17	Constructing Dudhala Tank	25,191		
			5,23,992	

The works having been transferred to the Executive Engineer, Khandesh District, this expenditure has been adjusted with that officer.

1. Q. (*The President*)—You are Executive Engineer of the Khandesh Division?—Yes.

2. Q. You are in charge of the district of Khandesh?—Yes, of Khandesh, and Baglan Division of the Nasik district. There are four taluks in my charge.

3. Q. I suppose your chief irrigation works are *bandharas*?—Yes.

4. Q. How long have you been in this Division?—Not quite 12 months.

5. Q. Where were you before?—I was in the Secretariat in Bombay; before that I was in Satara.

6. Q. (*Mr. Muir-Mackenzie*)—Were you not in Nasik?—Yes; I was there five years ago. I was in Satara for a couple of years before I came here.

7. Q. (*The President*)—How long were you in Nasik?—About two years, but I did not see much of the district; I was on the Godavery Bridge.

8. Q. Do you know of any sites for tanks in the Khandesh district?—Yes, I reported on a site and recommended that a tank ought to be built as soon as possible.

9. Q. How far is the Public Works Department responsible for the repair of *bandharas*?—Only when they get into a very bad state, and become practically useless, we then prepare the estimates and do what is necessary.

10. Q. What is done in the case of petty repairs?—The villagers look after that. They generally let them get petty bad before repairing them.

11. Q. You have no separate establishment to supervise the work?—No, our establishment has a tremendous lot to do and cannot see to everything, and when our attention is called to the want of repairs we attend to them at once.

12. Q. Do you visit the *bandharas* periodically?—I have not visited all, but in the short time I have been here, I have inspected a large number.

13. Q. I suppose if you notice anything wrong you call upon the people to make the necessary repairs?—Yes; if anything wants putting right or needs clearing I call upon them to do it.

14. Q. They are responsible for such repairs, but do they generally carry them out?—Yes; they have done so up to the present.

15. Q. Have you never heard of them refusing to do it?—I have heard they neglect to do so sometimes, but that is not my experience.

16. Q. Generally speaking, as far as your experience goes, do you think that the system works very well?—Yes, very well indeed.

17. Q. As to the distribution of water, how does your system work?—In a bad year it does not work well; the villagers economize water in their own villages.

18. Q. In ordinary years, about what proportion of the whole land is irrigated? Is half irrigated?—I should think so.

19. Q. In a bad year when water is scarce, presumably prices are high?—Yes.

20. Q. Would the villagers in such times not cultivate more extensively by ploughing up the fallow lands?—I have never seen them do it.

21. Q. With the inducement of obtaining higher prices for their produce would they not extend irrigation?—No; because they are not sure that there will be sufficient water to extend their irrigation. If they were perfectly certain that there would be a good supply of water, they would extend it.

22. Q. They would not risk it?—No; they are very keen but cautious.

23. Q. The waste water goes back into the river?—Yes. The overflow goes back to the river and is taken up further down by another *bandhara*.

24. Q. What do you think ought to be done to stop the people from wasting water?—I should propose that the Land Revenue Department should have legal authority to control the water-supply. For instance, in a year of drought, we cannot stop the water when we like. If people choose to take water we cannot prevent them.

25. Q. (*Mr. Muir-Mackenzie*)—I suppose you do prevent them?—There is no law to support us in doing so. If the people in a village are obstreperous we cannot cut off the river supply. The Irrigation Act and the Canal Act do not apply to the second class irrigation works.

26. Q. What are second class irrigation works?—Those that pay consolidated revenue.

27. Q. (*The President*)—Suppose you say to the villagers "you will get water for so many acres; you shall not have any more," would they question your legal power?—No; they would agree.

28. Q. You told us this morning about eight of your *bandharas*. Is there any water left in them after the monsoons?—Yes; in ordinary times when the river flows.

29. Q. The Mukti tank reservoir is now dry?—Yes entirely; the river supply has failed practically; we have no water-supply in the river.

30. Q. You have practically only tank irrigation now?—Yes, the Panjhra fails, but the Girna goes on always.

31. Q. Does the tank take canal water only?—Yes.

32. Q. And the Panjhra?—No.

33. Q. How long has the tank been in existence?—For the last 20 years I think, but I don't know exactly how long.

34. Q. Is the Mukti a large tank?—No, it is rather a small tank.

35. Q. How long does the water last?—With a little economy the water lasts till the next monsoon.

36. Q. (*Mr. Muir-Mackenzie*)—Was it not stated in correspondence that the Executive Engineer had power to control the water supply?—No; we cannot stop the river water supply.

37. Q. (*The President*)—Have you seen these eight *bandharas*?—No; I have seen only three of them.

38. Q. Do you know the country well enough to say whether if a tank twice or four times the size of the Mukti were built it would be possible to extend irrigation?—Yes, I have been told it would be. We have petitions to extend it.

39. Q. Do you know anything of the tank projects in the Ghats?—One or two only. There is the Punpara which is about half finished.

40. Q. Could your *bandhara* system be extended to irrigate a greater area than at present watered?—Yes, if there was a storage reservoir.

41. Q. Do you think you would then require a more elaborate system of supervision and distribution?—I do not think so; I think the people could manage it fairly well themselves; they manage it now perfectly. There must, however, be some authority which could interfere if they wasted the water; otherwise I would suggest that it be left to them.

42. Q. Do you think the channels should be enlarged?—No; I do not think any village could extend its irrigation sufficiently to require an enlargement of the channel for the present.

43. Q. But beyond the villages?—At present we have four cubic feet of water; I don't think irrigation can be extended two or three times more than it is at present. All the canals really run along the village bank.

44. Q. What is the area irrigated on this district?—About 12,000 acres and in Nasik about 25,000 acres; that is, under the *bandharas*. If they are extended I do not know if the present channel would be big enough; but the *bandharas* would bring more villages under cultivation.

45. Q. The present *bandharas* and the present channels could be enlarged to enable the water to pass to another village?—I think squabbles would take place if one channel had to serve two villages. It is better to allow a channel for each village.

46. Q. It would be more expensive?—Yes; we should make new canals and carry them through more than one village.

47. Q. You have told us about the Chandkapur tank?—Yes; it is in the north-west part of Malegaon.

48. Q. You say "the irrigable area is 10,445 acres"?—Yes.

49. Q. There is to be a big *bandhara* on the left bank?—Yes.

50. Q. Has that not been built up yet?—No; it is a part of the Chandkapur project.

51. Q. I believe that the earthwork of the left bank is finished?—Yes; the canal and the *bandhara* are finished; but none of the masonry work has been done.

52. Q. Do you know at what stage the project is just now?—It is either before the Government of Bombay or the Government of India. It left my hands long ago.

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Mr. Gahagan. 53. Q. You say some work was done on it during the famine?—Yes; it was started some thing like 25 years ago; Rs. 70,000 or Rs. 80,000 were spent on it. The masonry dam could not be done by famine labour.

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54. Q. There is to be a masonry dam?—Yes.

55. Q. How high?—About 85 feet; some objections were raised to the height.

[Mr. Higham explained that the objection raised by the Government of India was as to whether the estimate of revenue likely to accrue was not based on over sanguine figures.]

56. Q. It is an old project?—Yes a very old project which is blocking the way of others. If the tank were completed we could construct more *bandharas*.

57. Q. Was it on the mean or the minimum rainfall that Mr. Tate calculated the project?—On the mean rainfall over several years.

58. Q. There is a good Ghat catchment where there is plenty of water and so there will be no doubt about the tank filling?—No; it will fill.

59. Q. What is the most important project in your Division just now?—The Purmapada tank; there are also some others. The Purmapada is nearly half finished. There is the Manad and also two others which we have condemned because the foundations are too deep.

60. Q. Where is the Purmapada tank?—It is about 15 miles from here; it is on the road to Malegaon.

61. Q. Are there any *bandharas* down there?—No. The water will have to be taken 37 miles down river before it starts irrigating. The point is whether the water will go down to that distance.

62. Q. Has the project gone to Government for sanction?—It is half finished. The dam is built, excepting the closing gates.

63. Q. Why was the work stopped?—It was a famine work which stopped with the famine.

64. Q. It is not being carried on as an ordinary work?—No.

65. Q. The estimate is Rs. 2,60,000?—Yes.

66. Q. The whole estimate is Rs. 4,40,000?—Yes.

67. Q. It is an expensive work?—Yes.

68. Q. (Mr. Higham)—The two lakhs of famine work done does not represent the value of the whole work done?—No, not by one-third.

69. Q. (The President)—Do you consider that the work is one which ought to be completed?—Yes, Government may think it can wait for another famine, but it would take 3 or 4 famines to finish it.

70. Q. (Mr. Higham)—When was the work stopped?—No work has been done since last December. The work was stopped last Christmas; there are a lot of works like that in this district. The famine stopped and the works stopped.

71. Q. The other works I suppose are of no particular value?—No, they were merely taken up to give the people employment.

72. Q. Are there any other tanks?—There is the Manad which was designed to supply the Jamboda canal; that is an important tank; the objection to it is its great depth; they have gone about 50 feet and they cannot get foundations. This tank is very important as the Jamda canal does not do what it was intended to do. It was constructed to supply water for sugarcane. The tank is badly wanted and the site selected is the only one possible.

73. Q. What about the Dudhala tank?—Nothing has been done to it except that it has been looked at.

74. Q. Have you a list of works for which the estimates have been completed?—I have not got one; perhaps Mr. Beale has.

(Mr. Beale)—The list is given in my report.

75. Q. (The President)—With this list to fall back on you would have no difficulty about a programme of relief works. You could turn the people on to them at once?—Yes, in my part of the district; I have plenty of projects ready.

76. Q. (Mr. Higham)—What are the limits of your charge?—The whole of Khandesh and the Malegaon Division of Nasik.

77. Q. You have many *bandharas* in your district. What is the total area they irrigate?—About 30,000 acres.

78. Q. I don't think the Jamboda canal is included?—It is not included in the *bandhara* system; it is a separate work.

79. Q. How many *bandharas* have you got?—We have 182 *bandharas* in both districts.

80. Q. How much land does the Jamda canal irrigate?—It irrigates about 5,000 acres.

81. Q. Have you any other canals?—No.

82. Q. The total irrigation in your Division is about under 50,000 acres?—About 120,000 acres in all; 37,000 from *bandharas*; 5,000 from the Jamda canal; and the rest from the large Government tanks.

83. Q. They don't feed the *bandharas*?—No, they irrigate direct.

84. Q. (The President)—The Jamda canal has a *bandhara*?—Yes.

85. Q. When are you going to finish the tanks?—I don't know.

86. Q. Would you keep the Chankapur back?—It has not been sanctioned yet.

87. Q. Do you know at what stage the project is?—The project came here nine or ten months ago and was sent back, and we have heard no more about it.

88. Q. Was anything done to it during the last famine?—Very little I believe; I was not here. I think very little indeed has been done to it since the 1897 famine.

89. Q. What about the Purmapada?—It was stopped when the famine was over.

90. Q. Have you any estimates for repairs?—Yes, they are ready, but have not been sanctioned.

91. Q. What about the Raipur?—Practically nothing has been done to it. I have received a petition against it.

92. Q. Have you gone into the points of the petition?—No, I only got it yesterday.

93. Q. (Mr. Higham)—Are there any schemes for building additional *bandharas*?—There are several. Two are now being made.

94. Q. Will you take them up as a second class work?—No. I think they should be taken up as first class works.

95. Q. Would you keep a capital account for them?—No. They only cost about Rs. 5,000 each.

96. Q. Would you charge consolidated rate?—No; but if people ask for it, it will probably be granted.

97. Q. Could you make them without a storage reservoir?—Yes. We could make them on almost every river except the Tapi, but they would all be the better for storage reservoirs. Those we are now working are on perennial streams and don't want reservoirs. There is room for more of these on the Girna and Mosam.

98. Q. You say it would be a great advantage to make borings for wells; is anything like that done?—Not here; I did some in Satara.

99. Q. Who did it; the Public Works Department?—Yes.

100. Q. Have you a set of boring tools?—Yes, we have three sets; we lend the machinery to the Mamlatdars; they do the work.

101. Q. How did they work?—I don't know; I left the district about that time.

102. Q. Did you find a good water supply?—Yes, in one place; that is all the experience I have.

103. Q. Do the people make applications for the loan of these tools?—I had three or four.

104. Q. You charge a nominal rate?—Yes, Rs. 5.

105. Q. Did you make any boring for the people and charge them?—No, never; we have not done that for anybody.

106. Q. In this district it has never been done?—No.

107. Q. Would it be useful?—Yes; it might be useful.

108. Q. (Mr. Ibbotson)—You say that 37,000 acres are irrigated; what would be the cost of establishment per acre irrigated from a *bandhara*?—I could not say.

109. Q. What is the cost of total establishment?—I could not tell; I can get the figures to-morrow.

110. Q. You have no new *bandharas* made which are now worked by Government?—No. We are building two.

111. Q. Do you think they will pay?—Certainly.

112. Q. There is no doubt about that?—No.

113. Q. On perennial streams?—Yes, or any stream with a reservoir.

114. Q. In order to control the distribution of water do you think that legislation is necessary to give you proper

power to do so?—I think it is advisable to give some such power to the Public Works Department or the Revenue Department.

115. Q. Did you have any trouble in getting the people to do their own share of the work?—No.

116. Q. Do you think that legislation is necessary in regard to repairs also?—I do not think so because I think the present Act covers it.

117. Q. You have power already?—Yes.

118. Q. Suppose you have not?—Then it might be necessary. I think we could make them do that.

119. Q. You say first class works pay water rates and the second class a consolidated rate?—They are called second class works simply for purposes of accounts.

120. Q. (The President)—The new tanks would be first class works?—Yes.

121. Q. The boring tools you have in Satara are for trial borings?—Yes, they are about 3 inches in diameter.

122. Q. You say any tank would be popular?—Yes.

123. Q. There is no irrigation tank in this district?—I am speaking of village tanks.

124. Q. Would they be popular?—There are some which are disused.

125. Q. Do you think there are sites on which small tanks could be constructed?—Yes, last week while out in camp in three days I found two good sites.

126. Q. Do you think there are plenty of sites?—Yes; as a matter of fact 50 sites are listed now; they could be surveyed.

127. Q. No general examination has been made?—No, and it is a very big list.

128. Q. You had to employ famine labour during the last two years; why was nothing done towards making these

small tanks. Do you think that people would use these tanks?—I think that they would.

129. Q. For what crops?—Generally for sugarcane, because it pays best. They get something like Rs. 100 acre of profit on sugarcane.

130. Q. You say small irrigating canals would not give a sufficient supply?—No; you could not irrigate sugarcane from them.

131. Q. Is there rice irrigation in this district?—Yes, in the Nasik Division. It is about the best rice grown. I am sorry to say that there was very little this year.

132. Q. Tanks would be valuable for that?—Yes.

133. Q. None exist at present?—I do not know whether small tanks would be useful unless they had wells under them.

134. Q. Would not they help the rice if the rain failed?—Yes. In some parts for the last month or so people have been using small tanks.

135. Q. Do you know any reason why tanks should not be successful?—I believe the only reason is want of water. There is no other objection to tanks.

136. Q. You say that in this district dry red crops don't grow under wells?—The people generally grow bajri; they don't grow sugarcane or rice.

137. Q. What area is irrigated per kos?—Between 4 and 5 acres with double bullocks.

138. Q. You say in a year of drought if they get water it would be very useful?—Yes.

139. Q. Do you know what happened to the wells during the last four or five bad years?—I was told they generally failed.

140. Q. Did they fail in 1896?—No.

141. Q. In what state are they now?—They are all dry, not a single well has a foot of water in it.

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WITNESS No. 43.—MR. MAHADEO CHINTAMAN KELKAR, Mamlatdar of Pimpalner.

Answers to printed Questions.

I.

Paragraph II—

	Acres.
(a) The gross or kamal area of the Taluka is in round figures	600,000
Deduct—	
Forest, unassessed waste, etc.	320,000
Remainder—	
(b) Culturable area	280,000
Deduct assessed waste—	
Unoccupied	60,000
Occupied	60,000
Total	120,000

(c) Remainder occupied cultivable area generally under cultivation 160,000

(d) Out of (b) area protected by—

(1) Government Irrigation works, second class (i.e., private river <i>bandharas</i>) and channels constructed by people in former times and now being repaired and looked after by the Government Irrigation Department in 42 villages out of 166 in the Taluka	95,000
(2) Private or village works	Nil
(3) Wells in 34 villages	70,000

(e) Area unprotected by any irrigation works in 90 villages 115,000
The proportions of (b) to (d) and (d3) are as under:—

(b) : (d) 1 :: 280,000 : 95,000	
= 100 : 34	
(b) : (d) 3 :: 280,000 : 70,000	
= 100 : 25	

The soil in this taluka is generally of poor quality, whitish in color and resembles the Mál land of the Deccan. There are some small tracts of rich soil of blackish colour in the western parts of the taluka. It differs from the very rich black soil of Eastern Deccan in being much less sticky. However, it appears to be most fitted for the irrigation purposes. Of 280,000 acres shown under (b) above, about 10,000 acres are dependent on artificial irrigation. The dry crops of bajri, cotton and kulthi are no

way dependent on artificial irrigation. But the remaining principal crops of the taluka, viz., sugarcane, rice and wheat, are solely dependent on it.

Rainfall.—It is not equally distributed all over the taluka. On the eastern plains it comes to about 15 to 25 inches, while on the western hillsides and the Ghats it goes up to even 50 inches. The average rainfall at Sakri during the last 10 years was 20 inches and 60 cents. In this taluka even during the south-west monsoons there is ordinarily a demand on the irrigation waters so far as the crops of sugarcane and rice are concerned. During the breaks in those monsoons these crops require watering.

I give below the irrigated crops of the taluka and the number of waterings they generally require for giving a normal yield:—

Crop.	Number of waterings required for complete growth.	The time of the year during which watering is required.
Sugarcane	25 to 30	The whole year.
Rice*	25 to 25	6 months, June to October.
Chillies	12 to 15	8 months, June to January.
Wheat	3 to 4	4 months, November to February.
Gram	2	Do. do.
Pea, etc.	3	3 months, November to January.
Sweet potatoes	10 to 12	4 months, at any time.
Ground-nut	8 to 10	6 months, January to November.

* The best thing for rice would be to have water always flowing in the land for the first 4 months.

Sugarcane and rice are grown only in Thal lands, irrigated by water from masonry *bandharas*, i.e., weirs constructed for the purpose of raising the level of the flowing water across the three rivers of Panjra, Kan and Burni and not in fields irrigated by well-water. The next four crops are also grown chiefly in the Thal lands as above, but they are also grown on well-irrigation, chiefly in villages having

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Mr. Kelkar. got no river *bandharas*. In the Thal lands the distribution of irrigating water is controlled by dividing the whole Thal area into four suitable parts called Phad, one of which is given to sugarcane, one to rice and two are left for the rest. The crops are taken by rotation over the whole area as 1 rice, 2 sugarcane, 3 wheat, 4 gram, etc., again, 1 rice, 2 etc. In the case of well-irrigation the distribution depends on the will of the owner.

In this taluka irrigation revenue is not realized as a separate water-rate or tax on the crop raised as in the case of first class irrigation, but as an amalgamated Kayam Bagayt-rate fixed by Survey Officers at the time of settlement, taking into consideration the quality of the soil and the strength of the water supply in the *bandhara* to raise particular crops. It ranges from Rs. 3 to Rs. 15 per acre.

Paragraph III.—In this taluka cotton is not generally sown in rich black soil but in poor soil. No tanks for irrigation purposes have been constructed in black soil in the taluka. Even in the black soil Thals there is demand for water in seasons of average rainfall and much more so in times of prolonged drought. The crops raised in such soil require to be watered even in years of average rainfalls. In this taluka the irrigated area is fixed once for all at the time of the survey settlement and assessed at Kayam Bagayt rates, and hence there is no scope for a falling off or an increase in the irrigated area as in the case of first class irrigation. People in this taluka are for a long time accustomed to irrigation and the advantages thereof, and so have been always anxious to increase the irrigation if it be possible. They know that the richer the soil the greater the profit, and so the villagers having such suitable soil in the three river valleys of the taluka are desirous of getting an opportunity for securing new or extending old irrigation. Consequently the construction of storage tanks on the three rivers to increase their irrigating water supply is awaited with great longing. There is no scope in this taluka for construction of small tanks for such or other soil either by private or by Government enterprise.

Paragraphs IV and VI.—There are no Government irrigation works as such so far as I understand the term. Irrigation works constructed and maintained at Government cost, from which water is given to intending irrigators of lands within the reach of the channels on payment of fixed water-rates for particular crops by the Irrigation Department, can only be termed *Government irrigation works*. This irrigation, I think, is called first class irrigation. As

I have once mentioned above, irrigation works in this taluka consist of masonry *bandharas* or weirs about 4 to 6 feet in height, constructed across the rivers of the Panjara, Kan and Burai, to raise the level of water therein and suitable channels and sub-channels emanating therefrom ranging in length from 1 to 6 miles for irrigating land in one or two adjacent villages. These works have been constructed more than a century before by the villages concerned at their own cost. The work of further repairs and maintenance of these works appear to have been handed over or taken up by Government, perhaps at the time of settlement, in consideration of the large amount of revenue collected thereon, and the system is termed *second class irrigation*. The original customs and rights of the irrigators are, however, kept up intact and are very rarely interfered with. The control over the water generally is supposed to be in the hands of the village Patil, assisted by some menial servants of the village irrigators, called the Patkari and Ilawaldar. The work of making petty repairs to and the cleaning of channels is generally done by the irrigators together. So in fact it can be said that the distribution is really controlled by the irrigators in general, and this always gives room for high-handedness of the Patils or big land-holders and petty complaints to the Revenue authorities who are supposed to have general control over them. If we leave aside the factor of Government taking up the repairs and maintenance of works, these irrigation works can be appropriately termed village works referred to in paragraph VI. But from the above description it can be said that the irrigation works of the taluka are partly Government and partly village works. In addition to these principal works there are a few villages in which some people put up every year small *kachcha* or *katmati* temporary *bandharas* on *nallahs* or tributaries of the rivers at their own expense, and raise minor irrigated crops of wheat, gram and pea. Hence I am going to answer both the points together.

The irrigation in the taluka is chiefly dependent on the water supply in the three rivers mentioned above. These rivers are small rivers taking their source in the western hills in the taluka, the northernmost branches of the Sahyadri Mountain. Their water has been arrested and utilized wherever possible by almost every village from the source to the mouth of each river. Consequently the irrigation in every village is solely dependent on the strength of the flow of the river water during whole of the year round. The statistics showing the irrigating capacity and range of variation of these irrigation works are given below :—

No.	Name of River.	Number of <i>Bandharas</i>	Number of villages served.	Area of Kayam Bagayt irrigated acres.	Maximum area irrigated in a best year.	Minimum area irrigated in a year of drought.
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(A) On Masonry *Bandharas* (Pukka).

				Year.	Acres.	Year.	Acres.
1	Panjara	30	17	3,397	1898-99	3,333	1899-1900
2	Kan	19	18	1,714	1895-96	1,555	1896-97
3	Burai	11	8	737	1895-96	718	1899-1900
		60	43	5,849	.....	.....	.....

(B) On *Katmati* or *Kachcha* temporary *Bandharas* constructed every year.

<i>Nallahs</i> and tributaries of the three rivers.	15	15	..	1898-99	110	1899-1900	40
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These *bandharas* being simple weirs to raise the level of water have no holding capacity, and so cannot be depended on in years of drought. About six *bandharas* on the Panjara and only two on the Burai could be depended on during the last two years which were of drought. On the Panjara there is comparatively a larger area of catchment and on both of them there are good perennial springs in a few places; consequently it is becoming essentially necessary to have storage tanks on these three rivers, which, if constructed, will highly increase the protective value of these works. As for the *kachcha* temporary *bandharas* (B) I may say that they cannot be depended on in a year of drought. Besides these there are no other possible sources of irrigation. I do not know whether there has been any law passed or executive order promulgated at the survey settlement in

which the responsibilities of Government in connection with the maintenance and repairs of these *bandharas* have been fixed. But as far as appears from the Government records, I think the irrigated land under these *bandharas* has been generally assessed at increased Kayam Bagayt rates ranging from Rs. 3 to 15 per acre at the time of original survey settlement, and in consideration of the large increase in the Land Revenue thereby effected Government have undertaken the maintenance and repairs to the *bandharas* and the main channels leading water to the village lands. For this purpose these works have been put in charge of the Irrigation Department and they construct necessary new works and execute repairs to these according to the requirements of the irrigators and the funds made available for the purpose. In this taluka about Rs. 48,000 are realised every

year by Government as Land Revenue from the Kayam Bagait, and on an average Rs. 9,000 are annually spent through the Irrigation Department, from whose records of these places I have got this figure. Last year only a special famine grant of Rs. 1,070 was expended on the silt clearance of the channels on the Kan River. In the case of the kachcha *bandharas* no responsibility whatever rests on Government, and only a temporary water-rate on the area actually irrigated is assessed and levied by the Revenue Department as royalty on the water. This water-rate is extra for the year only and ranges from Re. 1 to Rs. 4 according to the strength of water-supply and the probable expenses incurred by the irrigators on the work.

This Kayam Bagait assessment on the irrigated lands forms part of the Land Revenue and is collected at the respective Land Revenue instalments. Its collection is not dependent on the raising of particular crops or the less or greater supply of water from the *bandharas*; consequently no general remissions whatever are granted to these irrigators even if the water-supply falls partially or completely. As a consequence of this system during the last two years all the Kayam Bagait assessment was to be recovered from the well-to-do or better class people, even if they could not get any or full value irrigated crops in their land. Only in the case of poorer agriculturists special famine remissions have either been granted or proposed along with other cultivators having no irrigated lands with them. This has worked very hard upon the irrigators (specially on the Kan River) who had to pay in the midst of famine difficulties Kayam Bagait assessment at Rs. 3 to 15 for water and crops, for which, justly speaking, they should have paid much less.

These *bandharas* are generally strongly built, and consequently there is very little chance of these works going out of order altogether. However, on such occasion arising, when owing to some great and accidental damage done to the *bandhara* or to the main channel irrigation of the lands concerned becomes impossible, Government do not become mercilessly exacting, but on proper inquiry give general remission of the irrigation share in the Kayam Bagait rates and recover only Jirait rates on the lands concerned. There are precedents for this statement in the case of Bladone and Daterti *bandharas*. New works resembling these pakka *bandharas* do not appear to have been constructed anywhere in the taluka by the people at their cost or by Government during the last 25 years or so.

I think the protective value of these works can be increased by devoting more money and great attention to their up-keep and improvement, and by constructing of big storage tanks on the three rivers. I may illustrate this with the following observations:—

- (a) The main irrigation channels leading water from the *bandharas* to the lands generally get silted and at times to a very large extent, thereby causing much obstruction to the flow of water. Consequently clearance becomes often necessary.
- (b) The *bandharas* also get silted if the scouring sluices are not timely opened at the time of floods. The irrigators are expected to do these works. However, in practice, unless there is a laudable unanimity about these things among the irrigators, which is rarely the case, these works are often neglected, being the business of all or nobody. This work, if done by Government Irrigation Department at regular intervals, will not cost much to Government, but will bring much good to the irrigators and so enhance the protective value of the works. There is very little scope for encouraging land-owners by suitable loans, etc., to construct any more new works in the taluka. In my opinion the protective value of the present works can only be increased and to a very large extent by the construction of storage tanks on the three rivers of the taluka. I would particularly urge on the necessity of taking up of the storage tank on the Kan River, as the irrigators thereon have already suffered much during the late years and particularly in the famine; and until that work is executed I would recommend general remissions being granted to these irrigators at certain fixed percentage, taking into consideration the particular circumstances of each *bandhara* concerned. If the three storage tanks are constructed, there will be scope for increasing the irrigation over an additional area of about 1,000 acres. The present irrigation works in this taluka do not serve any purpose concerning village water-supply for men and cattle.

Paragraph V.—I have nothing to say with regard to Mr. Kelkar. this point.

Paragraph VII.—

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		Areas.
Approximate area irrigated by wells in ordinary years		1,200
Approximate area irrigated by wells in years of drought	1899-1900	1,800
	1900-1901	1,600

I am unable to say how many new wells were constructed annually during the last ten years. However, from what statistics I have collected I can give the following information:—

Total number of agricultural wells in the taluka	800
(1) Number of wells not in use	250
(2) Number of wells in actual use	550
(3) of (2) The number of wells constructed or repaired by Government Tagai loans	80

Under the present rules of Tagai advances no concessions are allowed to constructors of new wells. I think it is possible and also desirable to stimulate the construction of new wells by more liberal advances or other inducements. In this connection I may point out that the existence of wells and irrigation thereon form a great protection to the cultivators in times of famine. If there is one good well in a village in famine times, it becomes a ready means for four or more families to join together and maintain themselves. This has been noticed by me during the famines of 1896-97 and 1899-1900. In this taluka too the same was the case. From the figures that I have given above it can be seen that during the last two years about half as much more area was irrigated on wells than in a normal year. This taluka has got only 42 villages that are protected by river irrigation works.

There are 34 that are partially protected by well irrigation. The remaining 90 villages have got no irrigation protection at all. In the case of the last two batches of villages there is still much scope for increasing well-irrigation, and from what I have seen of the people during the last two years-and-a-half I can confidently say that the people have an aptitude for well-irrigation and can with advantage be induced to take to it. But under the present system of Tagai advances it becomes rather difficult to push on the system, as the cultivators in these villages are generally poorer classes and have not sufficient security to offer or are not in a position to bear the inevitable results of a failure in the work. Under the circumstances I believe that a more liberal system of Tagai advances, in which remission of interest and partial or total remission of the advance in case of failure of attempt to obtain water would be possible, will stimulate the construction of new wells and increased well-irrigation.

Though there has been an increase in the irrigated area or wells during the last two years, still I think that the supply of water in wells is affected to some extent by the drought during the period, and during the current year the affliction has been very much as a result of the previous scarcity of rain. Some of the wells that had become dry were deepened with good results. No statistics as to how many failed entirely or were abandoned is available; still from my observation I may say that such instances were rare. In this taluka one has generally to go down about 20 to 30 feet from the surface of the earth before he can tap water, and the construction of an average well ready for irrigation costs about Rs. 150 to Rs. 200. Such a well serves an average area of 4 acres.

Paragraph VIII.—In this taluka instances of lands or crops being injured by water-logging or excess of water even in very wet years are not known. I have noticed no drainage works here, and I do not think any are required on any grounds.

Paragraph IX.—During the last famine no relief labour was employed in this taluka, which was seriously affected, on any irrigation works. It was chiefly employed on metal-breaking for Local Fund and Provincial roads and construction of new roads. The Ghorda-Chinchpada Road was taken up and left unfinished. Some small works in Government forests were also undertaken as far as I know. I am unable to say how much money was spent on these works, but I think some lakhs of rupees were spent on the first two works. Last year about Rs. 800 were spent on clearing of silt from two village tanks useful for men

Mr. Kelkar. and cattle only, and as a consequence they have become more useful. I think it is desirable to complete the construction of the Ghorda-Chinchpada Road, as it forms part of the Provincial Trunk-road from Dhulia to Surat and also will be useful as a road facilitating communication from Pimpalner, the most important commercial town of the taluka, to the Chinchpada Station on the Tapti Valley Railway.

Paragraphs XII and XIII.—The statistics and the information referred to in these paragraphs relate to first class irrigation, and so are not available here.

Paragraph XIV.—As for the protective value of the existing second class irrigation works in the taluka, I have made some observations in answering some of the previous paragraphs. I have, however, to say something on the points referred to in this paragraph. From my inquiry in the taluka I learn that the protective value of these works was best exemplified during the famine of 1896-97. During the early period of the monsoons of 1896 an abnormally high rainfall was experienced in this taluka, and that had the result of keeping up a good supply of water in the *bandharas* to a maximum strength. This gave the irrigators an excellent rabi harvest and afforded a very large field for agricultural labour to the irrigated and non-irrigated villages in their vicinity as well. Generally every normal year the harvest of sugarcane-pressing and wheat-reaping affords much labour. Under the circumstances, though all the non-irrigated kharif villages had to face a scarcity of grain and labour that year, still the irrigated villages being much better off afforded a great protection to these villages also. While during the last famine the irrigated villages having suffered for want of water in the rivers concerned, the scales were turned and the taluka as a whole had to undergo a very serious distress. Relief works, poor-houses, kitchens, and extensive dole lists had to be opened, and very large amounts from tagai and Indian Charitable Funds had to be advanced for affording relief to the people during the year 1899-1900, while very little of the sort had to be done during 1896-97. I am, however, not in a position to say to what extent the cost of famine relief would have been increased if these works had not been in operation.

II.

A.—GENERAL.

1. These answers refer to the Pimpalner taluka of Khandesh district. I have been working at this taluka as a Mamlatdar since July 1899, and the following answers are based on what I have observed personally of the people and the crops and on authentic information collected by me.

2. The average rainfall in each month for the last 10 years is given below :—

Month.	Inches. Cents.	Month.	Inches. Cents.
January . . .	0 5	July . . .	5 6
February . . .	0 3	August . . .	3 18
March . . .	0 1	September . . .	4 1
April . . .	0 6	October . . .	1 55
May . . .	0 65	November . . .	0 41
June . . .	5 40	December . . .	0 2

3. I do not think there is any obstacle to the extension of irrigation within certain limits in this taluka. Supposing that storage tanks are constructed on the three rivers of the taluka and a steady and sufficient water-supply is kept up in the *bandharas*, I think that about 1,000 acres can be easily added to the total irrigated area of the taluka, which is about 8,000 acres. There may be more scope for further extension if water is available, but then I think some obstacles will have to be faced, chiefly arising from—

- (1) sparsity of population ;
- (2) lack of capital for the initial expenditure for growing the more expensive irrigated crops ; and
- (3) want of labourers.

The taluka is thinly populated and has got a very large culturable area (280,000 acres). Consequence is that more than 20 per cent. of it is lying as unoccupied assessed land and as much lies fallow every year from the occupied land. However, there is a very extensive grazing land available

and so the people have greatly advantageous opportunity of keeping and breeding a large stock of agricultural cattle, chiefly cows and bullocks, and they make use of it to their advantage. Before the late famine this taluka was very rich in this respect and now, though it has lost about 50 per cent. or more of these, still I think they will regain their strength in this respect if a few good seasons follow continuously. The bullocks that are bred in this taluka are of superior quality and quite suited to the cultivation of irrigated lands. The abundance of cattle supplies good and abundant manure. The soil is, I think, suited for the *bandhara* irrigation, as it is not like the rich black cotton soil. Excepting the last few years, the monsoons are known to be sufficiently regular in the commencement and cessation and hence no uncertainty of the supply of water is ever known to have affected the crops. I think there is sufficient capital in the taluka and the *bantias* have been found to be generally willing to invest capital in the irrigated land. The people appear to be generally satisfied with the existing revenue assessment and will not neglect irrigation for fear of enhanced rates. The number of cultivators of land being small as compared to the extent of agricultural land, they get lands, even irrigated, at very moderate rent and so have no fear on that account. I have not heard of any complaint about uncertainty of tenure or the tenancy law, nor do I think there is any scope for such complaint under the present Land Revenue Code. In the present state of the taluka, in a year of good kharif and rabi harvest there is a want felt of sufficient number of field labourers, and wages go much higher than what they are at present. But I think, if more irrigation is possible the grains will naturally attract sufficient numbers from the surrounding villages and talukas.

4. No new irrigation works have been constructed in the taluka for a long time by private capital and no instances of exemptions of enhanced assessments are known. I do not think there is much scope now in the taluka for any more permanent irrigation works being constructed by private capital. But if any were possible, I would certainly recommend some liberal measures, such as granting of exemption of the bagait assessment on the land irrigated for a certain number of years, say, 30, according to the expenses incurred and the water-supply maintained.

5. There are no instances of tagai loans being taken for construction of irrigation work such as *bandharas*, etc. However, people have taken to well-irrigation in villages having no river irrigation since the last famine and are now gradually taking a liking for tagai loans. During the last two years about Rs. 8,000 were given for construction of new and repairs of old wells. There is, however, much scope for a large extension of this kind of irrigation in the taluka. Under the present system, however, it becomes rather difficult for the people to accept and for us to give any very large advances for the purpose. The people who are chiefly in need of well-irrigation belong to poorer classes and have got no sufficient security to give for the loans. As jirait land is comparatively very cheap in the taluka, we do not advance generally more than five times the amount of assessment on the land offered as security. Consequently one who asks for a loan of Rs. 100 has to offer security of land assessed at Rs. 20 or thereabout, which is not always practicable. For such loans personal security cannot generally be depended on and solvent cultivators do not generally offer to stand security for such people. Consequently for this taluka at least I would strongly recommend any or all of the liberal measures given below :—

- (1) Reduction of the rate of interest.
- (2) Remission of the interest.
- (3) Partial remission of the advance.
- (4) Total remission of the advance in case of failure of the attempt to obtain water.

As the present rules stand, I think no extension of period of repayment is necessary. The well tagai loans never exceed Rs. 300 in each case, and I think a period of 12 to 15 years is quite sufficient for the convenient repayment of the loan with interest.

6. I do not think the extension of irrigation tends to injure the remaining cultivation by attracting its cultivators to the irrigated tracts. No instances of this sort are heard of in this taluka. People of this taluka are accustomed to irrigation and know the benefits thereof and so have evinced a strong desire to have means of irrigation increased.

B.—CANALS OF CONTINUOUS FLOW.

My remarks under this head are based on the results of second class irrigation, under which system there is

always a fixed area irrigated under each *bandhara* and this whole area is assessed at Kayam Bagait rates (permanent amalgamated Land Revenue and water-rate) independent of the kind of crop produced or water actually supplied. I have had no experience of first class irrigation.

Irrigation increases the value of the produce of the land to the following extent:—

- | | |
|--|---|
| (1) By rendering it possible to cultivate two harvests instead of one. | } 1½ to 2 times the Jirait produce. |
| (2) By leading to the substitution of more for less valuable crops. | |
| (3) By increasing the yield— | |
| (a) in a year of ample rainfall. | } Such cases are very rare. I have not seen of lands irrigated simply with the object of increasing the usual Jirait yield. |
| (b) in a year of scanty rainfall. | |
| (c) in a year of drought. | |

In a year of scanty rainfall or a drought the Jirait or first crops in the irrigated area is at times watered by the channel water, as there is then no hope of securing the Bagait crop. This way the owners of land succeed in getting a good and more valuable (on account of scarcity) Jirait crop. But I do not consider this to be any substantial increase in the value of the produce; on the other hand, it has to be remembered that the owner has to pay the full Kayam Bagait assessment under the present system of Land Revenue collections.

8. (1) As for the approximate estimate of the increase in the total annual value of the produce per acre due to irrigation, I have got no special statistics collected; still from a close inquiry with some of the experienced cultivators in the taluka I have got the following data and have prepared an estimate for a village which has got 300 acres of irrigated land on the Kan River and where the irrigators have to pay Rs. 8 per acre as Kayam Bagait assessment. When four successive normal years follow the irrigators get a full rotation of crops and so can be said to have enjoyed the full advantage of irrigation. I give in Appendix A, attached hereto, my estimate of the net value of produce per acre of Thal land (i.e., ordinary good level land cultivated) irrigated, as compared with the same when unirrigated. From the figures it will be seen that in the first case the increase is approximately three times as much.

(2) In a year of drought, if the water could be kept up to its full strength, there would be further gain on account of the high prices of the outturn. But if the supply would fail, the irrigator will even find it very difficult to have a kharif crop.

9. (1) There are no cases of cultivators or owners of lands paying annual water-rate to the owner of the canal.

(2) If a tenant cultivates irrigated land as a tenant of the owner, he pays from Rs. 5 to 10 per acre in addition to the Kayam Bagait assessment.

(3) The owners of irrigated land pay to Government an amalgamated Kayam Bagait rate from Rs. 3 to 15 per acre, instead of the Jirait rate from annas 8 to Re. 1.

In the two cases above cited the tenant pays the rent on the irrigated area leased out to him under the agreement and in the third case the owner has to pay on the whole irrigable land he holds in the irrigated Thal area, irrespective of the crop raised or water supplied.

10. The irrigator has very little expenditure to incur to bring the water to the field from the main channel. He has, however, to prepare the land to be irrigated much more carefully and diligently than in the case of Jirait land. He has to put in its manure worth about Rs. 5 on an average per acre per year and to till and turn it over and over from 4 to 10 times even. When such land is leased to a tenant, the landlord either shares the extra expenditure or the tenant gets a lease for lengthened period of about 10 to 20 years as a guarantee.

11. The irrigators who do not manure their lands properly certainly suffer in not getting a full and valuable crop. I have, however, not heard of any land deteriorated for being irrigated without manure, or from too profuse or too extensive or too frequent irrigation, from water-logging, salt efflorescence or otherwise. In this taluka I have found that in the irrigated lands in some villages there is a regular arrangement of draining away excess water of irrigation, and this certainly induces to the welfare of the crop.

C.—CANALS OF INTERMITTENT FLOW.

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Such canals are very few in this taluka and the area irrigated by them annually is quite insignificant. Consequently I have very few occasions to acquire detailed information in connection with them. They are simple temporary earthen dams put across a flowing nallah, to direct water therefrom for irrigating a few adjacent survey numbers. They are generally erected at a cost ranging between Rs. 5 to Rs. 25 and irrigate only a few acres. On their water the crops of wheat, gram or pea are only taken, and their flow lasts for about two to four months in an average rainfall season. The owners of the irrigated lands themselves do all the work in connection with them and enjoy the benefit thereon by paying an extra water-rate of Re. 1 to Rs. 4 per acre. I think it is advisable to stimulate this kind of irrigation by means of suitable tagai advances. However, people in this taluka have not shown any very ardent desire to extend such irrigation. I also think that there is not much scope for extension of this irrigation. I am not in a position to answer in more detail the questions Nos. 12 to 22, and so leave them with these remarks.

D.—TANKS.

• There is no irrigation carried on the water from tanks in this taluka; consequently I have nothing to say with regard to questions Nos. 23 to 33.

E.—WELLS.

34. In this taluka wells are generally dug in the eastern plains, where there is no scope for river-irrigation. These wells are generally of very small size. They are rectangular in form and of following dimensions:—

6' x 8' or 8' x 10'

Consequently they have very small holding capacity as compared with the big wells of the Eastern Deccan. The depth of water is generally from 4 to 10 feet. The quantity is only sufficient for the requirements of a day or two, but it is renewed from percolation or side springs within the breaks in the irrigation work.

(1) The average depth of permanent wells is from 20 to 30 feet.

(2) The supply of water on this side is from percolation from the sides and not from springs from the bottom. They are not seen to become any way saline anywhere, but the supply is liable to fail in years of drought. But experience shows that the supply is chiefly affected during the year following the year of drought, if that year rainfall is again scanty. In ordinary years they do not fail appreciably.

(3) Average cost of construction is Rs. 150 to Rs. 200.

(4) A properly constructed well built on four sides is said to last even for 100 years.

(5) Water is usually lifted by means of leather water lifts or *mots* generally drawn by two bullocks.

(6) The average area attached to and commanded by a well is about 16 to 20 acres.

(7) The average area irrigated in one year is about 3 or 4 acres. This is due to the very small holding capacity of the wells.

35 and 36. In the case of well-irrigation I have not been able to obtain authentic information pertaining to the points noted in these questions, still from my general information I make the following few remarks. Well-irrigation requires much more labour from man and bullocks than *bandhara*-irrigation. It supplies the cultivator with ready means of subsistence in times of famine. Sweet potatoes, chilli, vegetable, wheat and other minor crops are grown on well water, and consequently no accurate estimate could be framed easily as to the extent of increase in the value of the produce of land or in its total annual value per acre. On the whole it can be said that the cultivator gets about 3 or 4 times the value of the Jirait crop on the same land.

37. There are rare instances here of land-owners of well-irrigated fields leasing them out to tenants, so I cannot say as to what do the tenants pay to them for these lands. On referring to the Government records of villages having wells constructed before the time of the original Survey Settlement, I find that no special bagait assessment or *motasthal* rate has been assessed on these lands. Consequently, I have to say that no additional revenue for the well-water has been paid by the owners of fields to Government. In other districts I have known that on such lands an additional rate called *motasthal* rate is levied.

Mr. Kelkar. 98. I do not think any serious difficulties are ever encountered by the people in selecting a spot for proposed wells or in their actual construction. They generally select a place of themselves from the surroundings and at times a few people are seen to be inclined to call in the aid of an expert or a Panbhakya (i.e., one who is supposed to foretell the existence of water in particular place or otherwise) at their own cost; as for construction there is ample supply of suitable stone and other materials required in the taluka. As yet there have been no instances in which assistance was offered by Government or by local bodies in the shape of expert advice, trial borings, etc. I think that such assistance can with advantage be given by making, if possible, the geological survey of the portions of the taluka in question and chiefly by free grant or grant at a very moderate rental of the use of boring tools in the wells in which water is despaired of by ordinary means available to the owner of the land. Trial borings also may prove of some value. As far as my experience goes I have found the people to dig their own wells without asking for any loans for the purpose, but when they make sure that there is water available and the work is being worth constructed they come up for a loan.

99. I am not in favour of the construction by Government of wells in land which is private property, as I think the scheme will not be liked or agreed to by most of the people.

(1) Construction of wells by private agency is far more easy and much less expensive than by Government agency. I think that a well which agriculturists construct for Rs. 200, will cost Government at least Rs. 300, if not more.

(2) Government will not be prepared to invest funds in such works if they are not used by the people concerned and if they will not get any return therefor in the form of additional water-rate at least on the land likely to be irrigated from them. This would necessitate the passing of certain agreement by the parties concerned, from which they can never recede afterwards. Cultivators will not be ready to accept the responsibility so far as I know.

40. If by temporary wells are meant bludkis or other similar kachcha wells, then I say that such wells are very rarely constructed in this taluka. There are some wells in the taluka which consist of only holes dug deep with water in them and without any masonry work, on which some land is sometimes irrigated by means of temporary arrangement on a wooden structure for raising water by a leather *mol* or water-lift. These are not properly speaking temporary wells but kachcha wells. I do not think any particular measures are necessary to encourage the construction of such wells in a year of scanty rainfall.

P.S.—With reference to question No. 5, I have to add a few remarks and I hope they may be taken for what they are worth. Against the present tagai system always two objections are chiefly raised: (1) that the recipients of the loans do not get them promptly as they get them from the sowkars; and (2) that they have to satisfy the demands of blackmailing by subordinate Revenue Officers.

As regards the first objection, I think that the objects for which tagai loans are asked for under the Land Improvement Loans Act, 1883, are not emergent and imminent necessities like the demands under the Agriculturists' Loans Act, 1884. Consequently, the granting of these can brook the delay without much injury to anybody, that is, at times inevitable on account of detailed inquiry that is to be made through the already hard-worked Revenue Officers. I do not think the people are any way discouraged by this delay from coming up readily for Land Improvement Loans.

As for the other objection, every officer who had to do something with these advances will have to admit that under the present system the evil is to some extent inevitable, as the very low-paid village officers cannot but be taken into confidence by the inquiring officer, howsoever he may try to be independent of them. The evil is only minimised if the Revenue Officer has the experience enough to see through their tactics and has a will to undergo a little more trouble necessary to make personal inquiries at the villages concerned.

Statement showing the estimate of the increase in value of the produce in an acre of irrigated Thal land over that in unirrigated one.

YEAR.	CROP.		GROSS VALUE OF CROP RAISED IN RUPEES.			EXPENSES EXCLUDING THE COST OF CULTIVATION AS REGARDS THE BULLOCKS AND CULTIVATOR'S OWN LABOUR.						Net benefit.
	Kharif.	Rabi.	Kharif.	Rabi.	Total.	Government assessment.	Manure.	Seed.	Weeding, etc.	Pressing charges.	Total.	
			<i>Bagail crop estimate.</i>			Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1st year	Bajri or tili	Wheat or gram or pea.	18	17	35	8	...	3	2	...	13	23
2nd "	Rice	.....	35	...	35	8	...	3	2	...	13	22
3rd "	Sugarcane	.....	110	...	110	8	20	12	10	25	75	75
4th "	...	Wheat single crop	40	...	40	8	...	3	2	...	13	27
		Total	243	17	260	32	20	21	16	25	114	146
		Average	...	...	65	...	...	...	...	...	28.8	36.8
Every year	Bajri or tili	.....	<i>Jirait crop estimate in unirrigated Thal land.</i>			1	...	0.3-0	1.8-0	...	3	15

1. Q. (The President).—You are Mamlatdar of Pimpalner?—Yes.

2. Q. How long have you held that office?—For 2½ years.

3. Q. Were you there during famine?—Yes.

4. Q. You have sent in a very interesting paper containing a great deal of detailed information. You say the culturable area is 220,000 acres?—Yes.

5. Q. Of these 165,000 are protected by *bandharas* and wells?—The largest area is under *bandharas*. The whole area is not, however, actually irrigated.

6. Q. About how much of the area is irrigated?—About 6,000 acres under *bandharas* and 2,000 acres under wells.

7. Q. Out of 95,000?—6,000 only.

8. Q. That is very little?—Yes.

9. Q. There are wells in 34 villages?—Yes.

10. Q. The area under them is 70,000?—The total area in 34 villages under wells is 2,000 out of the total culturable area of 70,000.

11. Q. About how much does each well irrigate?—About 3 or 4 acres.

12. Q. You say in your reply to printed questions "people in this taluka are for a long time accustomed to irrigation." Is there any demand for an increase in the number of *bandharas*?—No; I do not think there is any scope for more *bandharas*, but if there was a better water-supply a larger area could be irrigated.

13. Q. You say only about 8,000 acres are actually irrigated every year?—Yes.

14. Q. Are the people very anxious to irrigate more?—Yes, there have been several petitions for a storage tank on the Kan river; that implies that if the present supply of water is increased a greater area will be irrigated.

15. Q. Tanks are better than wells?—Yes; and inquiries have been made about constructing storage tanks; last year a project was framed to make a tank on the Kan river, but I think it was rejected.

16. Q. Are there any disputes among the villagers about the distribution of water from these *bandharas*?—If there is only one village under the *bandhara*, then there is no dispute; but if the water goes down to two or more villages from the same *bandhara* then generally there are disputes; but people manage to take the water by turns. If the Irrigation Department distributes water by means of distribution pipes to two villages at the same time, then that gives cause for complaint; but if there are turns fixed, then there are no complaints.

17. Q. To whom do they complain?—To the Irrigation Department and also to the Collector.

18. Q. Are there any sites in your taluka in which storage reservoirs might be made?—Yes; there are. There is one on the Panjara river; one on the Kan, and one on the Burai.

19. Q. Have they been examined?—Yes, the Panjara project was considered some years ago. The project on the Kan was submitted but was rejected. There was some correspondence about the Burai river project and it was surveyed last year.

20. Q. You say, "I would particularly urge on the necessity of taking up the storage tank on the Kan river." That is the one you have just mentioned?—Yes.

21. Q. What was the name of the proposed tank?—The Malangam tank at Dahiwal.

22. Q. Was Dahiwal tank begun as a famine work?—No.

23. Q. Do you think it is very important for your taluka?—Yes; for I think *bandharas* on the Panjara are better placed than on the Kan.

24. Q. Is there any demand for an increase of well-irrigation?—Yes, there has been since the last famine.

25. Q. Are takavi advances in demand?—Yes, during the last two years I have given about Rs. 8,000 for wells.

26. Q. Do the people often come to you for takavi?—First they make petitions to me and in the course of time I submit them to the Prant who sanctions the grants.

27. Q. Do they make any complaints about the rate of interest or about the time allowed for repayment?—No, because the time allowed is quite sufficient.

28. Q. How long does it take a man to get his advance?—Generally he gets it within 2 or 3 months.

29. Q. Do they pay 5 per cent.?—Yes.

30. Q. Do they complain about it?—I do not think so.

31. Q. (Mr. Ibbetson).—How long have you known this district?—I have been in this district for 2½ years.

32. Q. Where were you before that?—In Satara.

33. Q. Is there much wheat grown there?—Yes.

34. Q. A very large area?—Yes.

35. Q. Is the area more than that under rice?—Yes.

36. Q. You say there is no scope in this taluka for the construction of small tanks?—Yes; I mean tanks for irrigation.

37. Q. Why?—Because there are very few sites at present in my taluka suitable for that purpose.

38. Q. There are no sites?—Very few.

39. Q. If there were sites?—Then I think more could be done.

40. Q. Would you recommend many tanks?—Yes.

41. Q. Do you think the people would use the water?—Yes, after they got used to that sort of irrigation.

42. Q. If they use water from the canals, *bandharas*, and wells, is there any reason why they should not use water from tanks?—Nothing in particular.

43. Q. Would it be useful for rice?—Yes.

44. Q. Could they grow wheat here if they got water for irrigation only up to the end of December or must they have

the water later on?—They must have the water till the end of February.

45. Q. The wheat crop would fail if the water failed before that?—Yes. 14 Dec. 61.

46. Q. You say that *kachcha bandharas* do a great deal of good in ordinary years although they are not much used in years of drought?—Yes, because in a year of drought there is not sufficient water for the *bandharas* to irrigate crops.

47. Q. If there is not enough water on the *kachcha bandharas* then there are the *pakka bandharas* that can be used?—Yes, the *pakka bandharas* are on a perennial stream.

48. Q. Are they useful in ordinary years?—Yes.

49. Q. (Mr. Muir-Mackenzie).—The population is very backward?—Yes; the cultivated area is very large as compared with the population, and consequently the people cannot cultivate a larger area.

50. Q. Irrigation increases the value of the crop a good deal?—Yes, about three or four times.

51. Q. Do you think the rate of interest prevents the people from taking takavi?—No.

52. Q. Supposing you said to a man, "you can use the water free of charge," do you think that he would make a *kachcha bandhara*?—Yes; he would be induced to do it.

53. Q. Would you make many more *pakka bandharas*?—No, because there are no perennial streams other than the three rivers mentioned above.

54. Q. Were any of the takavi wells made in the famine of 1896 or 1899?—In 1899 famine.

55. Q. Are they *pakka*?—Yes, some of them; and some of their are *kachcha*.

56. Q. Do you think they will be used?—Yes; because generally I find that in villages where there is no *bandhara* irrigation people take to well irrigation, but where there is *bandhara* irrigation people do not like wells.

57. Q. Why are half of the number of wells marked as out of use?—Because they are not used for one reason or another.

58. Q. How is the area irrigated by wells increased by 50 per cent. in the year of drought?—Because then there is no dry crop. In my taluka there are large dry crop areas, and the people don't care to have well irrigation.

59. Q. At what rate of interest could a cultivator borrow money from a bania?—At about 12 per cent.

60. Q. Then they don't complain of the Rs. 5 rate charged by Government?—No.

61. Q. You don't think it is heavy?—No.

62. Q. Will you recommend it being reduced?—Yes.

63. Q. Why?—To induce people to come forward and make wells where there are no wells. It would be a real inducement, while it would not make any serious difference to Government.

64. Q. Would it make any difference in the case of an entire remission?—There would be a difference.

65. Q. (Mr. Ibbetson).—What remission?—Remission of a takavi advance in the event of no water being found.

66. Q. What would you remit?—I should remit all the money spent for the purpose of sinking the well if water is not found.

67. Q. How are you to know how much has been spent?—That can be ascertained.

68. Q. Do you think there would be no difficulty about that?—No.

69. Q. Supposing a man borrows Rs. 500 for a well and spends some portion of it on a wedding, how would you know how much he had spent on the well?—By a panch-nama. Besides I would not give him the whole advance unless he finds water.

70. Q. Would you work with the trial shaft first?—Yes, Rs. 25 should be given to begin the work with the shaft.

71. Q. You would never give an advance unless there is water?—Yes; I have never done so.

72. Q. Do the people know that they will be assessed on wells which they make?—They think that at the time of the Revision Settlement they will be assessed. That is my supposition.

73. Q. Don't they know what the law is?—No.

74. Q. Do you think they are assessed more?—Yes.

75. Q. What security do you take?—We generally take the land as security.

Mr. Kelkar. 76. Q. What else?—Nothing.

14 Dec. 01. 77. Q. Is the land sufficient security?—It would be after the well is constructed.

78. Q. There are I suppose cases in which a man's whole land is not a sufficient security?—Yes, there have been such instances.

79. Q. How many years do you generally allow for recovering the loan?—Up to eight years, with instalments of from Rs. 15 to Rs. 25.

80. Q. The law allows up to 20?—Yes.

81. Q. Do you think eight years are enough?—I think they are with about Rs. 15 to Rs. 20 as annual instalments. It would depend on the amount advanced.

82. Q. Would you recommend from 12 to 15 years?—That should be the maximum time allowed for a loan of Rs. 300.

83. Q. Do you ever give more than 8 years?—If a man gets Rs. 250 or Rs. 300 we give more than ten years.

84. Q. You say "even in the black soil *thals* there is demand for water in seasons of average rainfall and much more so in times of prolonged drought." Have you ever seen black soil irrigated here?—I have described it in my paper; the black soil in my taluka is not black cotton soil; it appears black in colour, but I do not think it is the same as the black cotton soil of Gujarat in quality.

85. Q. Is it irrigated?—Yes, it gives a very good crop.

86. Q. (Mr. Rajaratna Mulr).—The present rule is that takavi should be recovered in 20 years; would you recommend the extension of the period to 30 years?—Yes. If a man takes takavi of about Rs. 1,000 or Rs. 2,000 for building a *bandhara* for irrigating a *thal*, then he would require an extension of the period to 30 years.

87. Q. In the case of a poor rayat, would you not extend the period supposing he takes Rs. 100?—That would depend upon the produce that he would get on the outlay. He should get out of debt as soon as possible and so I won't recommend a longer period.

88. Q. If he chooses to do so, he can pay within the period?—Yes.

89. Q. Would it be an inducement to extend the period to 30 years?—Yes, in the case of large loans. Under ordinary circumstances the people gladly pay Rs. 10 or Rs. 12 a year.

90. Q. You say that the rayats are not aware that their improvements will not be taxed at the next revision of settlement. Are they under the impression that there will be an enhancement?—Yes. There will be enhancement on account of higher prices; but the people won't believe that it is on account of the increased prices; they will only think that it is an increased assessment.

91. Q. The increase on land in which a well is constructed will not be higher than the increase upon land which

has no well?—Under the Land Revenue Code I don't think it should be higher.

92. Q. Should there be a guarantee to the rayat that improvements are not to be taxed?—Yes.

93. Q. Do you think the matter should be explained to them?—Yes; that would induce them to take loans.

94. Q. If the facts are properly explained to them, would they take more takavi?—Yes, it would stimulate them to do so.

95. Q. Do you think the rayats know the value of irrigation?—They don't like well irrigation in my taluka. They prefer *bandhara* irrigation because it is very easy to work. Well irrigation takes more time, money, and labour.

96. Q. Are there possibilities of extending *bandhara* irrigation?—How many acres more would you irrigate?—About 1,000.

97. Q. On the existing or new *bandharas*?—Under the existing *bandharas*; there could be no new *bandharas*. If you make a new *bandhara* between two *bandharas*, the people would object to it.

98. Q. The new *bandharas* would affect the supply of lower *bandharas*?—Yes, consequently there would be objection to the making of new *bandharas*. If there is a storage tank that would increase the supply of water and that would give them the opportunity of extending irrigation.

99. Q. You would rather have a storage tank?—Yes.

100. Q. Do you think the people would be willing to construct these tanks if they were exempted from paying water rate?—No; because they would not have sufficient funds.

101. Q. You refer to the necessity for granting remissions on certain *bandharas* if storage reservoirs are not constructed?—Yes, I refer to the Kan river.

102. Q. Are the lands not irrigated from *bandharas*?—Yes, they are. But they don't give very valuable crops. Where they used to get sugarcane crop before, now it is not possible for them to get it.

103. Q. What is that due to?—On account of the diminished supply of water in the river.

104. Q. What assessment do they pay?—Full assessment. The consolidated assessment has been based on the rotation of crops.

105. Q. For how long has cultivation of sugarcane disappeared?—I think for about twenty years in some villages.

106. Q. In this case you would recommend the reduction of assessment?—Yes, but I would not recommend reduction on all areas. In the case of villages where there are no complaints I would not recommend any reduction.

WITNESS No. 44—MR. R. B. STEWART, COLLECTOR OF KHANDESH.

Mr. Stewart. 1. Q. (Mr. Muir Mackenzie).—Were you in the Panch Mahals during the famine?—Yes.

14 Dec. 01. 2. Q. Were many *kachcha* wells dried up?—Yes; a good many.

3. Q. Were they spread over a large area?—Yes; they were used for irrigating grain and fodder crops.

4. Q. How many acres did each well irrigate?—I do not remember.

5. Q. About 2 or 3?—I should think about 4; I am not certain.

6. Q. Did each well cost much?—No, very little. We only advanced Rs. 30 to Rs. 50 as takavi. They dug the wells themselves; what they wanted money for chiefly was water bags, ropes, etc.

7. Q. I suppose at the end of September you stopped advancing takavi for wells?—No; we gave a good deal after September; I went there in the middle of September; we made considerable advances after that. I am pretty sure that we made advances even in January.

8. Q. For wells?—Yes.

9. Q. Is a large amount of takavi given out in the Panch Mahals after September in ordinary years?—No.

10. Q. Do you think that it would be a good thing if in case of the failure of rains before September measures were taken to distribute a large amount of takavi to

enable the people to construct *kachcha* wells?—Yes, provided the people will utilize the wells. In one case a Patel told me that he had four oxen, of which three had died owing to drought, and he had a well the whole time.

11. Q. He made no attempt whatever to irrigate a crop?—No.

12. Q. If money was available he could have got some?—Yes, but he did not want it in that particular instance.

13. Q. The system should be to give takavi advances by the end of September if rain fails, for *kachcha* wells?—Yes.

14. Q. On what was famine labour particularly employed in the Panch Mahals?—On roads principally.

15. Q. And on what else?—On tanks so far as we could get sites. We could not get very many.

16. Q. Do you prefer tanks to roads?—Yes; I prefer large tanks. I have not had much experience of small village tanks; we have tried them and I think they are very difficult to manage.

17. Q. Difficult to supervise?—Yes; we had very great difficulty in getting establishment. We had to employ Talatis for these works. It is difficult to make them understand what is wanted of them and as a consequence in many instances they muddled matters.

18. Q. You think either large or small tanks should be made by famine labour?—Yes.

19. Q. If tanks are made do you think the water will be used in ordinary years?—No; the people would not use the tanks in ordinary years.

20. Q. But they get a superior crop by irrigation?—Yet I doubt if the majority would appreciate it. The Kolis are in the majority, and I doubt very much whether they would take advantage of the water on account of the extra labour involved.

21. Q. Would the water not be taken up by the Bhils even for rice?—No; the Bhils as a class are not very good or industrious cultivators.

22. Q. Are there not a sufficiently intelligent number among them who would build *kachcha* wells?—*Kachcha* wells are built more in the west than in the east. The district is divided into two parts. There are not many *kachcha* wells in the Bhil region.

23. Q. I presume that the introduction of takavi would not induce such people to dig many wells?—I do not think it would. There are places where they could dig wells in the Panch Mahals but they do not care to do so.

24. Q. In 1896-97 you were in Nasik?—Yes.

25. Q. You know all this area very well?—Yes.

26. Q. Do you think that the river supply without any big storage tank will generally give a sufficient water-supply for these *bandharas*?—It will generally suffice for the existing area, but it is not safe without a reservoir.

27. Q. Would you prefer a series of storage tanks?—Yes, certainly; as they could supplement irrigation in good years if necessary.

28. Q. Was much takavi granted in 1896-97 in Nasik?—No.

29. Q. Was there a demand for much more than was granted?—No, I don't think so.

30. Q. What step would you suggest for stimulating the demand for the purpose of building wells? Do you suggest any alteration in the rules in the shape of lower interest or longer periods for payment of instalments?—I don't think you want either. The interest is very small compared with the bazaar rate and the present period is quite long enough. It is not necessary to create a fictitious demand. One of our Deputy Collectors gave away enormous sums of money in one year for takavi which was not used for agricultural purposes.

31. Q. It was misappropriated?—Yes; but there are real demands in particular parts, and we ought to see that they get money easily.

32. Q. Do you think that the rate of interest is a deterrent?—I do not think so.

33. Q. You say the people could be induced to take advances, but would they take them on the clear understanding that the money would have to be spent on wells?—Yes, certainly they know that perfectly well. I know of a few cases where money has been misappropriated in my charge; but it was perfectly easy to recover it at once. In a certain village there were 2 or 3 people who took about Rs. 200 each for wells, and two months later the Mamlatdar reported that they had not commenced digging. I directed him to recover the money and he did so.

34. Q. They probably had not spent the money?—No, so it was easy to give it back.

35. Q. The only thing that would induce people to take takavi for wells is the personal energy and influence of individual officers?—Yes, that is so.

36. Q. (*Mr. Rajaratna Mdlr.*)—Do you pay the takavi in instalments after a certain amount of work is done?—Yes; very often in good years we require a man to show that he has found water. He digs a well out of his own resources and if he finds water we give him money to build up the well.

37. Q. You would not give him money to dig a trial shaft?—Yes; if there is no doubt about the man's honesty.

38. Q. But should there be any doubt about the man you have his land as security?—We have probably to limit the amount of money given out, as the man may not use it in building a well and give us trouble to recover it.

39. Q. Your doubt applies to his misappropriation and not to his security?—No; there is no doubt about the security: we satisfy ourselves about that.

40. Q. If he applies for Rs. 200 and is paid Rs. 50 as first instalment and then after inspecting his work you pay the rest, would that not be a check against misappropriation at least to a great extent?—*Mr. Muir-Mackenzie*. I think that is done.

41. Q. (*Mr. Ibbetson*). You have got no rock for digging wells in the Panch Mahals?—Very little.

42. Q. How can a man dig a well before you give him an advance?—It is not absolutely necessary for him to dig a well. The Assistant Collector goes round and if the man shows that he is actually working on the well, he gets an advance.

43. Q. His *bonâ fide* is ascertained?—Yes.

44. Q. Do you think that for want of time to make such enquiries a large number of people who were *bonâ fide* desirous of digging wells did not get advances?—Yes; the Mamlatdar has to make enquiries on the spot and he seldom travels with as much energy as he should for the purpose. I am afraid there is a great deal in the complaint that the people don't get the full amount of takavi from the Mamlatdar's office. I do not think there is much doubt that some of the money sticks. An Assistant Collector should go round and satisfy himself on the spot and pay the money himself.

45. Q. You cannot check the leakage?—No, the man goes to the office, and applies for the money, giving a rupee or so to somebody. It is difficult to stop it.

46. Q. (*Mr. Muir-Mackenzie*).—You think the best way to protect this district against famine in the future is by extending the number of wells as largely as possible in Nasik?—It would be a very good thing in Nasik; they are easily made with very little labour and will be valuable in times of famine. Many were built in 1876-77 and were not used for years; they were cleared out and used again in the last famine.

47. Q. Would it be attractive to the people to give them grants for the construction of wells and to charge them only *bagail* assessment in the land actually irrigated under the wells? Would you favour that proposal?—I do not think it would be popular.

48. Q. Give the man possession of the well and merely fix an assessment on the irrigation?—I have never seen it tried or consulted cultivators about it.

49. Q. Would you object to it being tried?—No.

50. Q. (*Mr. Ibbetson*).—Are wells of any use as famine works?—I have never tried it myself, it was suggested by some one last year.

51. Q. (*Mr. Muir-Mackenzie*).—They did dig trial shafts?—That was all that was tried.

52. Q. Would you employ famine labour on well work?—No, I do not think famine labour is good for that kind of work; we give the people takavi and allow them to do the work themselves. We did that in Nasik in some villages in 1896-97. The people not only started works, but they kept village labourers employed.

53. Q. Did they cultivate everything?—Yes.

54. Q. Do you think many people would be inclined to do that?—I do not know; I am rather doubtful about it.

55. Q. Why?—Because sometimes they fix sites for wells and don't find water.

56. Q. You might advance a small sum of money for a trial shaft; you could risk that?—Yes.

57. Q. My point of view is not so much the matter of employing famine labour as to derive some means for the protection of the country against famine? Would you have Government construct wells?—At present I would not.

58. Q. Do you think that Mr. Simcox's estimate of Rs. 250 for the construction of a well is correct?—Yes, it is very fair.

59. Q. What would it cost to make a well through the Public Works Department?—I do not think it would cost more than Rs. 300.

60. Q. You would not advocate Government constructing wells?—I would rather see the people do it themselves.

61. Q. If there were Government wells do you think people would take water?—Yes.

62. Q. We have cases of people allowing their wells to fall into disuse; there would be some fear that in ordinary years they would not take water?—We could take an agreement that the assessment will be paid whether the well is used or not.

63. Q. In that case you are sure they will take water. At any rate you agree that it is worth while trying?—Yes.

64. Q. Would you prefer tank work to anything else for famine labour?—Yes, I think it is easier to supervise;

14 Dec. 01.

Mr. Stewart. you can manage it better, but there is always the danger of disease breaking out.

14 Dec. 01. 65. Q. There is not the same danger on road works?—No, the people are a great deal more scattered on road works.

66. Q. A tank may possibly be of service, but some roads cannot possibly be of any use?—Yes, some of the roads constructed by famine labour are of no use.

67. Q. Tanks may possibly be of some use?—Undoubtedly.

68. Q. (Mr. Ibbotson).—It has been suggested that where takavi has been given to make a well and the man has been unable to get water it should be remitted; what do you think of that?—I think it would be only fair to remit.

69. Q. Would there be any practical difficulty in finding out how much a man has spent on the work?—I don't think so; a *panch* could generally fix what has been spent.

WITNESS NO. 45—MR. DHONDO SHAMRAO GARUD, Pleader, Dhulia.

Answers to printed questions.

A.—GENERAL.

Mr. Garud. The answers given below refer to the Dhulia and Chalisgaon talukas of the Khandesh district and the Malegaon taluka of the Nasik district. I am the proprietor of more than 1,200 acres of land in the aggregate in the Chalisgaon and Dhulia talukas of the Khandesh district and am the Jagirdar of Chandaupuri in the Malegaon taluka of the Nasik district.

2. The average rainfall in each month of the year in the Malegaon, Chalisgaon and Dhulia talukas is as under:—

Name of Taluka.	May.	June.	July.	August.	September.	October.	November.	December.	January.	February.	March.	April.	Total.
Malegaon	0'66	5'12	4'22	4'09	6'09	3'51	0'54	0'50	0'20	0'16	0'1	0'23	24'41
Chalisgaon	0'71	6'42	5'28	5'82	7'13	2'67	'36	'98	14	'14	0'3	...	29'70
Dhulia	'39	5'12	5'05	3'88	4'49	1'86	0'73	0'34	0'37	0'08	...	0'02	22'36

3. (1) No.

(2) There has been gradual decrease of cattle since the introduction of the Forest Laws; and the number is much reduced by the famine of 1900.

(3) Same as above; due to same reasons.

(4) No.

(5) No; except in years of famine or drought.

(6) Yes; there is lack of capital for raising expensive irrigated crops.

(7) Not that I am aware of.

(8) Up to the passing of the Land Revenue Code Amendment Act there was no uncertainty. People believed that the rights enjoyed by them were secure. Since the passing of the Land Revenue Code Amendment Act this faith in the stability of their tenure has been considerably shaken. They are inclined to imagine that at any time their vested rights might be interfered with.

(9) Nil.

5. Loans are not freely taken by the people for the extension of irrigation because Government officers feel that the responsibility of recovering the loans lies upon them; and they therefore take great deal of time in completing their inquiries; and even then recommend only persons of well-known solvent circumstances. The rayats are also chary of taking these loans because their punctual re-payment is rigidly enforced; and very often the rayat is obliged to

borrow money from sowcars to repay over-due instalments of tagai loans.

(1) I would recommend the reduction of the rate of interest to Rs. 4 per cent. per annum.

(2) No.

(3) No.

(4) I would recommend total remission in case of failure, of the attempt to obtain water.

(5) The rules under the Land Improvement Loans Act (XIX of 1883) are sufficiently liberal. What is wanted is that they should be carried out in the same liberal spirit. I would recommend that in seasons of famine or scarcity, repayment of instalments of tagai loans should generally be suspended.

6. I am not in favour of grants-in-aid.

(1) No.

(2) Owing to the frequency of famine in recent years the desire for having means of irrigation as a measure of protection has increased; thus in good season irrigation from wells is not much availed of.

E.—WELLS.

84. The average depth of permanent wells is 30 feet. Water is generally supplied by springs. It is liable to fail in seasons of drought only. Average cost of construction is Rs. 400 with two *mots*. With ordinary repairs a well will last more than 40 years. Water is usually raised by *mots*.

(6) The average area attached to and commanded by a well is 4 acres.

(7) The average area irrigated in any one year is 2 acres.

88. (1) Yes. Very often attempts to obtain water are unsuccessful.

(2) Generally no serious difficulties are experienced in the actual construction of wells, but professional advice would be of value.

Never to my knowledge.

It would decidedly be useful to provide expert advice, make trial borings and supply boring tools to ascertain the supply of subsoil water. It is desirable to have a specially trained establishment for this purpose.

39. No.

40. Very rarely. For the year in which they are dug they are a protection against drought. In a year of scanty rainfall tagai should be given for digging wells.

1. Q. (The President).—Are you a resident of Dhulia?—Yes.

2. Q. I suppose you know Khandesh very well?—Yes.

3. Q. You were here during the last famine?—Yes.

4. Q. What do you think would be the most suitable steps to take to better ensure Khandesh against another famine than it was this time?—I would recommend encouragement in the increase of making tanks and wells.

5. Q. What tanks do you mean, large or small?—Small tanks which would be completed during the year, not large ones which cannot be completed and used for years.

6. Q. You mean tanks adjoining villages?—Yes, those tanks which would raise the water level of wells adjoining them and would give protection to people in time of famine.

7. Q. What would the people grow under them, would they grow rice?—Wheat and other crops.

8. Q. In the beds of the tanks?—Yes.

9. Q. You don't think they would grow anything under the embankments of the tanks?—If there is water in the tanks, then they would grow rice, wheat and other crops.

10. Q. They would hardly grow wheat in the monsoon?—Wheat is grown in the cold weather.

11. Q. Could that not be tried in a year of drought?—One or two waterings would be quite sufficient for wheat.

12. Q. You say "loans are not freely taken by the people for the extension of irrigation, because Government officers feel that the responsibility of recovering the loans lies upon them—and therefore recommend only persons of well-known solvent circumstances"?—I mean solvent within the knowledge of the Mamlatdar; there may be other people solvent, but they may not be known to the Mamlatdar.

13. Q. What do you propose?—I propose that a man who has no mortgages on his land may be given takavi upon the security of his land.

14. Q. Could a man very easily prove that he has no mortgages?—The Mamlatdar can satisfy himself from the village officers; the Patels know whether a man has mortgaged his land or not.

15. Q. How long does it take generally to get takavi advances?—A long time generally; they have first to make applications to the Mamlatdar, who sends them to the village officers to make inquiries.

16. Q. How long does it take altogether?—I should think it takes more than six months. *Mr. Garud.*

17. Q. Do you think that, if the interest was reduced to 4 per cent. from 5 per cent., it would make much difference?—It would make repayment more easy. *14 Dec. 01.*

18. Q. Would you recommend that Government should lend money without interest at all?—No; Government are taking a low rate of interest already.

19. Q. Do you consider the *bandhara* system, as practised in these provinces, is a good system?—Yes, it gives water to the nearest village for drinking purposes and irrigation.

TWENTY-SECOND DAY.

Poona, 18th December 1901

Witness No. 46.—*Mr. C. N. CLIFTON*, Superintending Engineer, C. D.

Answers to printed questions.

I.

A.—GENERAL.

1. The Collectorates of Poona, Ahmednagar, Sholapur, Nasik and Khândesh, but more especially to Poona, which is my head-quarters, and in which district the two principal irrigation works are situated. I was formerly Assistant Engineer in the Poona Irrigation District and the Nira Canal (then a separate charge) from 1880 to 1886, but principally on construction work. Lately I have been Superintending Engineer, Central Division, but my work includes, in addition to the irrigation, all the Provincial and Local Fund works in the Division as well as the Military works in all Military Stations except Poona and Kirkee and Devlali. I have also, during the tenure of my office, had extensive famine works in my Division.

2. This information will be given in the reports for each district.

3. (1) I do not think it so.

(2) Not as an ordinary rule, I believe. There may be difficulty now in obtaining cattle for ordinary agriculture, owing to losses during the famine, but the irrigated area is not very extensive, and there should be no difficulty in getting a suitable supply of cattle even for extended irrigation.

(3) I think there is no great scarcity of manure, as far as I can learn.

(4) There are obstacles to irrigation in black-soil in so far as the cultivators are not willing, and as a rule do not require water to irrigate black-soil for food-crops. Where water facilities are available, however, they are very willing to extend irrigation to black-soil for sugarcane and other valuable crops.

(5) There are obstacles in some cases owing to uncertainty of supply of water and its too late commencement or early cessation.

(6) I do not think that fear of enhanced rate or revenue assessment is an obstacle. The people are well acquainted with the rules and rates of water, at all events where there is only crop rate charged. There may possibly be such fear in cases of lands where consolidated rate is charged, but I am unable to speak definitely on this point.

6. I do not think so. Yes. In Khândesh and Nasik, where people with lands under *bandhāras* are constantly petitioning for storage works and improvements. The Chankapur Tank is a particular case in point. I think, generally speaking, that there is a desire among the people to have means of irrigation extended or increased.

B.—CANALS OF CONTINUOUS FLOW.

7. (1) It is not a general rule and in fact I believe very exceptional to have two harvests. The people are not enterprising enough, and there would possibly be difficulty in obtaining enough manure.

(2) There is always a tendency to increase the area of sugarcane garden and other valuable crops where water is available.

9. The average rate per acre paid in the form of a crop rate is given in Statement G of the Irrigation Revenue Report of the Bombay Presidency. Statement I-F giving water-rates in force on the different works.

(2) For ordinary cultivation roughly Rs. 4 per acre, for Mr. Clifton. sugarcane as much as Rs. 20.

(3) None.

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Above rates are paid on area actually irrigated.

C.—CANALS OF INTERMITTENT FLOW.

These questions will be answered by the officers of the various districts. I have not the time at my disposal to describe the conditions of the different works in my five districts.

D.—TANKS.

By this, I presume, are meant village tanks, of which there are few or none in this division.

E.—WELLS.

34. This information will be sent by the officers of the various districts. As my charge comprises an area of 32,000 square miles, it would be impossible for me to give information as required for each of the main tracts. A reference might be made to a report on the best means of encouraging the extension of well irrigation by Mr. F. D. Campbell, C. E., circulated with Government Resolution No. 448 C.W.—1059 of 23rd June 1885.

II.

2. There is ordinarily a demand for water in the Deccan during the south-west monsoon for perennial and valuable crops, but not as a rule for cereals or food-grains. These latter given good rainfall come to maturity without artificial watering, and the cultivators refrain from applying for water. The crops that require irrigation number of waterings, etc., are in the Poona District as under:—

Class of Crops.	Period.	Number of waterings.
1. Perennial— (Sugarcane, garden crops, Pān, etc.).	All the year round	28 to 35
2. 8 months— (Potatoes, sweet-potatoes, ground-nuts, chillies, onions, garlics, etc.).	July to February	15 to 20
3. Monsoon, dry— (Jowāri, Bajri, Tur, Mug, etc.).	July to October	2 to 6
4. Monsoon, wet— (Rice, wheat, etc.).	July to October	4 to 8
5. Rabi— (Jowāri, gram, wheat, etc.).	October to February.	3 to 6
6. Hot-weather— (Fodder, etc.).	April to June	6 to 8

Mr. Clifton. The distribution is controlled by Departmental subordinates with suitable staff of Inspectors, Patkaries, etc.; also measurers where crop rates are levied. The irrigation revenue is for the most part realized in the shape of a crop rate. In the case of the 2nd class works in Násik and Khándesh, in the form of consolidated rate.

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3. Black-soil is not in my opinion suitable for tank embankments. The usual practice in tank dams in this Presidency is to have a portion of the interior of the dam to consist of a hearting made of mixture of black-soil and murrum or sand.

Masonry core walls have not been used to my knowledge. Where the land irrigated is black-soil, it is not found that there is much demand for water for monsoon crops in a year of average rainfall. Where, however, there are facilities for irrigation, there is always demand for water for sugarcane and garden crops on black-soil land. In case of prolonged drought, there is of course demand for water. In such soils although there may be a falling off in the irrigated area in a good season, still it is difficult to estimate, as in bad seasons the area irrigated may be limited by scarcity of water in the tanks or canals. In any case the revenue is not much affected, as it depends more on the quantity of sugarcane and valuable crops irrigated. There is a desire for irrigation works on the part of owners of black-soil, but it is for the cultivators of sugarcane, etc., and not for monsoon crops.

5. There are no Provincial Irrigation Works in my charge.

6. There are very few of these and very little information at my disposal. Such tanks are useful for men and cattle and to keep the sub-soil water at a high level.

7. Many wells ran dry. I understand that in the Poona District alone only 25 per cent. of the wells (excluding those under the influence of canals and tanks) were worked during the late famine. Average depths of wells in the Deccan may be said to be from 30 feet to 40 feet and a good well costs from Rs. 1,000 to Rs. 1,500. Kacheha wells are from 15 feet to 25 feet and cost from Rs. 100 to Rs. 500. They are usually what are called "Burkis" at the sides of náls or near canals. The ordinary acreage served by a well is as under :—

For sugarcane from two to three acres.

For fruit-trees from four to five acres.

For food-grains from six to seven acres.

8. There are practically no lands or crops injured by water-logging. The irrigation on this part of the Presidency is not on a sufficiently large scale to cause such, and the general conformity of the country does not lend itself to it either. There was at one time a certain amount of water-logging near Poona where extensive irrigation of sugarcane exists, but this has been lessened by more careful rotation and distribution of the water. No drainage works required.

9. A statement* is attached showing classification of the works on which relief labour was employed during the late famine.

The uncompleted works which I consider it desirable to complete as a charge against Imperial Revenue are as under :—

Násik District—1 Wághad Tank.

Ahmednagar District—2 Maládevi Tank.

3 Ojhár Right Bank Canal and Musalwádi Tank.

4 Visápur Tank.

Khándesh District—5 Chánkápur Tank.

Poona Irrigation—6 Shetphal Tank.

7 Victoria Tank at Warwand.

Sholápur District—8 Pathri Tank.

9 Wadshivana Tank.

Of these No. 6, the Shetphal Tank, is already being completed as a Protective Work. It is to be filled from the Níra Canal during the monsoon and will serve a large tract of country near the tail of the Níra Canal. The Maládevi Tank (No. 2) is favourably situated in a Ghaut District, and will provide storage for the existing Láksh Canal and Ojhár Left Bank Canal and for the New Ojhár Right Bank Canal (No. 3) which depends on the completion of the Maládevi Tank for its supply. The Musalwádi Tank is a Storage Tank to be filled from the Ojhár Right Bank Canal during the monsoon. As before said, the question of completing these two works depends on the Maládevi Tank being completed. It will be a very valuable protective work. The same remark applies to Chánkápur (No. 5) and Wághad (No. 1). These are respectively Storage Tanks to supple-

ment the supply to the various *bandhárás* on the Girna and Kadwa River, and to extend the irrigation of the tracts of country below them, and being both in Ghaut Districts are likely to be very valuable Protective Works. The Wághad Tank classed as a productive work, is nearly completed. The Visápur Tank (No. 4) in the Ahmednagar District has a large catchment area and is situated in a part of the country where irrigation is badly wanted; although it is doubtful whether the tank will fill regularly, till as it will probably pay its working expenses, it might be considered. The same remark applies to the Warwand Victoria Tank (No. 7) in the Poona District which will serve to irrigate 3,000 acres of rabi crops. As regards the Pathri Tank (No. 8) and Wadshivana Tank (No. 9) in Sholápur, they are well on to completion, and it would be a pity not to finish them, especially Pathri which is intended ultimately to supply the important mercantile centre of Bársi with water. The other large tank works commenced as famine relief works in Sholápur and elsewhere, I would leave as they are to be continued if required in the future as famine works. They are in rainless tracts and would be of little protective value as in years of drought they would not fill. This is the experience gained from the Ekruk, Mhaswad, Ashti and other tanks in the eastern portion of the Sholápur, Poona and Khándesh Collectorate. The Odal Tank in Násik and Parmapada Tank in Khándesh are intended to feed *bandhárás* lower down the river on which they are situated, and even though they did not fill would supplement the water-supply to the existing irrigation, so that there is perhaps more to be said in their favour than in that of the others from which canals have to be taken.

13. It is difficult to give a scale of water rates for the whole of my Division which is over 32,000 square miles in extent. These water rates vary on different works and are sanctioned and modified from time to time. Statement I-F, however, of the Irrigation Revenue Report of the Bombay Presidency, excluding Sind, gives statement of water rates per acre in force on irrigation works. Distribution is controlled by special establishment varying with the different conditions and requirements, and there is no general system or ratio of establishment to area irrigated or length of canal or anything of that kind. Tanks are generally empty or nearly so at the end of the irrigating season. The exceptions are the Khadak-Wasla (Lake Fife) and Ekruk Tank, in which case water has to be husbanded for the supply of water to Poona and Sholápur, respectively. Otherwise they would also be empty, every available drop of water being used for irrigation. Irrigation works get no credit for increase of revenue due to their construction, the revenue being limited to amount realized as water rate. The charges for maintenance and establishment are in some cases exaggerated by reason of the same establishment being employed on civil works. For instance, Ahmednagar and Násik are Imperial Irrigation Divisions, though the bulk of the work there, is other than irrigation and the irrigation works there are looked after along with roads, buildings and other public works, and in the case of Ahmednagar extensive Military Works by the Executive Engineer of the district. Sholápur, on the other hand, a neighbouring district to Ahmednagar, is a provincial charge, though the irrigation works are about four times as extensive as those in Ahmednagar. Still the maintenance costs more than the revenue management on every work in Sholápur, while an exactly opposite state of things exists in Ahmednagar. The proportion of working expenses to capital outlay is a little over $\frac{1}{2}$ per cent. in Sholápur, while it is nearly 4 per cent. in Ahmednagar. The Revenue Accounts of such large works as the Mutha and Níra Canals may be taken as fairly accurate and indicating the financial results obtained.

14. I consider the protective value of irrigation works in the Deccan very limited. The Níra and Mutha are good works (though the Mutha is not classed as protective) as they have Ghaut catchments, but the tanks in the eastern part of the Division where the rainfall is precarious can be said to have little or no protective value. If the rainfall happens to be good and the tanks fill, it is quite probable that water may not be freely availed of and if the rains fail the tanks do not fill. Even this year after a moderately good rainfall the Mhaswad Tank, a tank classed to protective with an enormous catchment, did not fill, the full supply level being some ten feet below the crest of waste weir. Famine relief was certainly required in many of the villages nominally protected by these tanks. I am unable to give any estimate of the extent to which the cost of famine relief would have been increased, if these works had not been in operation. There was, however, no doubt a considerable saving in the portion of the Poona District from the fact of the Níra Canal being in operation.

* Not printed.

1. Q. (*The President*).—You are Superintending Engineer of the Central Division?—Yes.

2. Q. How long have you held that position?—Two years.

3. Q. What has been your previous experience of irrigation?—I was in Sindh and on the Mutha and Nira canals some years ago, but principally on construction. I have not had much experience of irrigation details in the Deccan.

4. Q. Did you ever have the administration of a canal as Executive Engineer?—Yes, in Sindh.

5. Q. Engineers have not much to do with administration there, it is in the hands of civil officers?—Yes; the revenue administration. The clearance and repairs, etc., of canals are in the hands of the Public Works Department.

6. Q. Is the *rabi* crop largely irrigated anywhere in the Deccan?—A good deal from wells, I think, and on canals where they exist.

7. Q. Do they irrigate *juari*?—Yes; I have seen some irrigated from the Nira Canal.

8. Q. And wheat?—Yes.

9. Q. You say in paragraph 3 of your memorandum, "black-soil is not in my opinion suitable for tank embankments. The usual practice in tank dams in this Presidency is to have a portion of the interior of the dam to consist of a hearting made of a mixture of black-soil and *muram* or sand". I suppose the fact of its being black-soil country would not prevent a dam being made if it was necessary?—No.

10. Q. Have you seen much irrigation in black cotton soil?—I have not had much time since I have been here to go into details.

11. Q. Are you aware that it is very strongly asserted that black cotton soil won't take irrigation?—Yes, I have heard it.

12. Q. You say in paragraph 9, "the uncompleted work which I consider it desirable to complete as a charge against Imperial Revenue are as under; Nasik District (1) Waghad Tank." What is the state of that tank?—It is nearly completed; it once failed and it was reconstructed. The object is to furnish water for improving the Falkhed and Kadva Canal systems.

13. Q. You say the work is going on?—Yes, the waste weir has not yet been finished; the final project will be sent to Government very shortly; it has been sent back for some alterations and will be resubmitted.

14. Q. Has it ever been before the Government of India?—No, only before the Local Government. This refers to present proposals for completion.

15. Q. (*Mr. Higham*).—Will the estimate go to the Government of India?—I don't think so, unless there is an excess over original estimate.

16. Q. (*The President*).—You recommend it should go ahead, and not be kept as a means of employing famine labour?—Yes. It is going on.

17. Q. You mention next the Maladevi Tank; what is the state of affairs there?—A good deal of the puddle trench has been done and the waste weir. It is the storage reservoir of the Pravari system that has been going on for the last two years as a famine relief work.

18. Q. (*Mr. Muir-Mackenzie*).—Very little work has been done on the tank; most of it has been on the canal?—The waste weir and part of the puddle trench has been done.

19. Q. A great deal has been done on the canal?—The Ojhar Right Bank canal has been completed except for the masonry works. There is no canal direct from the reservoir.

20. Q. (*The President*).—The masonry works are not yet sanctioned?—No.

21. Q. Have designs gone in?—An estimate has gone in, I don't think it has been approved; most of these famine works have been going on on rough estimates; I have not had time to complete projects.

22. Q. What are the best works to finish at once so as to obtain an early return upon what has already been spent?—The Patri and Wadshivna in Sholapur; they are rain-fed tanks; the Waghad the only one which is nearly completed. The others are only just begun.

23. Q. Has the Shetphal Tank no catchment of its own?—No, it is to be filled from the Nira Canal.

24. Q. In what state is it now?—Most of the earth-work is completed; it has already some water in it.

25. Q. Will it be ready for the next monsoon?—Yes, I think so, we can fill it up as we like; the upper part of the dam has to be finished. *Mr. Clifton.*
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26. Q. (*Mr. Higham*).—You can fill it every year?—Yes, the water of the canal is not much used in the monsoons, we have one tank on the Mutha Canal of the same kind, the Matoba tank, and have found it very useful.

27. Q. (*The President*).—What stage is the Khamgaon tank in?—It has been partly carried out but it is not a work that we can fill under present circumstances. The difficulty is that we cannot put the whole calculated discharge of 400 cusecs through the tunnel.

28. Q. Is that on account of the water-supply of Poona?—Yes. The Poona tunnels just below the pumping station and if more than 200 feet per second be passed down the water is headed back and the wheel stops.

29. Q. Is the extension of irrigation retarded by this?—Yes, it is impossible to widen the present tunnel; we cannot close it; another tunnel could be made.

30. Q. How long is it?—About $\frac{2}{3}$ ths of a mile through rock.

31. Q. The neck of your bottle is, you may say, choked?—Yes, we could pass it down but for the water wheel. It is an ordinary Poncelet wheel. Mr. Visvesvaraya is considering a project for improving matters.

32. Q. (*Mr. Muir-Mackenzie*).—Why was the tank made if it is impossible to fill it?—As a famine work there was no better work available. With good rains it may fill.

33. Q. Would there be any difficulty in substituting some other kind of wheel to get over the difficulty to which you refer?—No, I think not, but Mr. Visvesvaraya has the question under consideration.

34. Q. The project for the Khamgaon Tank was got up long ago but it was rejected as the foundations were not considered suitable?—Mr. Visvesvaraya found a new site and it was sanctioned.

35. Q. It was really sanctioned as a famine work for want of something better?—Yes, like the Warwand tank.

36. Q. If these questions had been considered years ago and estimates prepared carefully, it would not have been necessary to do these works in a hurry?—No.

37. Q. You say in your note, "the other large tank works commenced as famine relief works in Sholapur and elsewhere I would leave as they are, to be continued if required in the future as famine works. They are in rainless tracts and would be of little protective value, as in years of drought they would not fill. This is the experience gained from the Ekruk, Mhaswad, Ashti and other tanks in the eastern portion of the Sholapur, Poona and Khandesh Collectorate." Is there any means of connecting the Ekruk, Mhaswad and Ashti with the hills with a view to storage?—I don't think so.

38. Q. Does the Mhaswad not fill?—It is in the north of Sholapur and has 480 square miles of catchment, but it is in quite a rainless tract; you may get the heavy Madras monsoons, but that is quite uncertain.

39. Q. And the Ashti?—That is also in a very rainless tract.

40. Q. Is it possible to get anything from the Bhima river into the tanks?—No, the bed is so low.

41. Q. (*The President*).—You say in your note, "tanks are generally empty or nearly so at the end of the irrigating season. The exceptions are the Khadak Wasla Lake (Lake Pife) and Ekruk Tank?—Yes, the Khadak Wasla is for the Poona water-supply and the Ekruk supplies Sholapur; we reserve the water for the towns, otherwise they too would be empty.

42. Q. Do you understand the principle on which some districts are classed Imperial and some Provincial?—No; there are many anomalies; the Sholapur district, for instance, is Provincial, and it has a larger area of irrigation than the Ahmednagar and Nasik districts which are Imperial.

43. Q. (*Mr. Higham*).—As regards these works on the Kadva river, the Waghad tanks, etc., I see that according to the estimate that was submitted when they were constructed they were estimated to irrigate about 8,000 acres; the actual area is about 2,500 acres only. Can you say what was the reason why they fell so far short of the estimate?—No, except that the waste weir has not been raised to its proper height and therefore the Waghad tank does not hold the full calculated supply.

Mr. Clifton. 44. Q. I am referring to all the works on the Kadva river?—We have had a very bad series of years; the rainfall has everywhere been very bad.

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45. Q. What is the present state of the Waghad tank?—The waste weir has not been built up to the full height.

46. Q. There is nothing to prevent that being done?—No; it is being done at present.

47. Q. To what extent will that increase the storage?—I cannot say.

48. Q. You say that in your opinion black-soil is not suitable for embankment of tanks; have there ever been any experiments to test the best kind of ingredients for dams?—I don't think so.

49. Q. On the Visapur Tank you are now mixing *muram* with black-soil?—Yes, in the proportion of 1 in 4; it is based on test experiments made on the spot.

50. Q. In the case of the Waghad Tank, what was the slip due to?—I don't know; the Ashti bank was founded on insecure soil, which when it got wet was like liquid mud and the bank sank into it; and at Pashan, a small tank for the Kirkee water-supply, also we had a slip; now we are very careful about the base.

51. Q. Do you think that slipping is due to founding on black-soil and not to the quality of the hearting?—No.

52. Q. You have had a good many of these slips?—Yes.

53. Q. Has there ever been a complete failure of a dam?—The Waghad was overtopped during construction; the Ashti is quite safe now and now holds water, but not much this year owing to bad rains.

54. Q. What are you doing to prevent water-logging in the Poona cane area?—We are taking great precautions now; we are distributing water in rotation and Mr. Visvesvaraya has taken great trouble about it; the water-logging is not serious.

55. Q. Is it less now than formerly?—I cannot speak from personal knowledge, Mr. Visvesvaraya tells me that is the case.

56. Q. Are there complaints of water-logging on the Nira Canal?—I have not heard of any; the country does not lend itself to it; it is on a good slope.

57. Q. Mr. Mullison said that it is rather serious on the Nira?—I have not heard of it, it has not come before me in any way.

58. Q. You referred to the Ekruk and the experience gained, saying that these rain-fed tanks will not fill?—Not habitually.

59. Q. The Ekruk has always had plenty of water during the late famine?—It was very short last year.

60. Q. I understand you to say that the Ekruk would have been empty long ago but for the wants of Sholapur? We have had to regulate its supply.

61. Q. Sholapur depends on Ekruk for its water-supply?—Yes, we have had to regulate our operations accordingly.

62. Q. The variations do not seem to have been very great on these tanks. What is the tank supposed to hold?—I cannot say offhand.

63. Q. As you complete these small tanks in Sholapur what will become of them; will they be maintained by the Public Works Department?—I think so in the same way as Ashti and others.

64. Q. And water-rates will be charged?—I think so.

65. Q. I suppose these tanks are all completed?—Only the Patri and Wardner which are nearly completed; the others are in the same state as the tank at Visapur.

66. Q. There has not been a single case of a tank in Sholapur being begun and completed as a famine work?—No, we cannot put many people on one tank owing to limited space for working.

67. Q. (Mr. Ibbetson).—What are the districts in your division?—Khandesh, Sholapur, Poona, Ahmednagar, and Nasik, all the revenue districts of the Central Division in fact, except Satara.

68. Q. You say in your note, "there is ordinarily a demand for water in the Deccan during the south-west monsoon for perennial and valuable crops, but not as a rule for cereals for food grains; these latter, given good rainfall, come to maturity without artificial watering." In how many years is there a good rainfall in the Deccan; putting the last five years apart, would it be two years out of 5?—My recollection is that they had good crops ordinarily without irrigation; I think they had a series of good years.

69. Q. You say "the irrigation revenue is for the most part realized in the shape of a crop rate. In the case of the second class works in Nasik and Khandesh in the form of a consolidated rate." Do you know what proportion of that consolidated rate is credited to water?—I cannot say.

70. Q. You have no opinion as to whether the credit is sufficient or not, you have never thought about it perhaps?—No; I cannot say; I do not think it is excessive.

71. Q. In your division have you anywhere a supply of water available for irrigation that is not made use of?—Yes; on the Mhaswad Tank we were able to supply 25 million cubic feet which was surplus to the Pandarpur Tank which is a water-supply tank.

72. Q. You were ready to give that for irrigation and no one was willing to take it?—Yes, this year and last year.

73. Q. Why was the water not taken?—I cannot say, except possibly want of manure and facilities for irrigation.

74. Q. (Mr. Muir-Mackenzie).—Were there any complaints about the system of distribution?—I have had no complaints.

75. Q. Was the area irrigated last year as much as in previous years or the supply of water larger than usual, or was the area irrigated smaller, or do you always have a surplus? I can only speak of these two years.

76. Q. Did you have a surplus in both?—Yes.

77. Q. What soil do you irrigate from this tank?—Black soil and reddish, I don't think there are any features in it different from other tanks.

78. Q. You don't think it was the soil that prevented people from using the water in larger quantities?—I do not think so; it is the ordinary soil of the Deccan, though possibly the country is more stony than elsewhere.

79. Q. (Mr. Ibbetson).—You have no idea what the reason was?—No.

80. Q. Was any effort made to induce the people to use the water?—I cannot say, the Executive Engineer, Mr. Godbole, could tell you.

81. Q.—What procedure is necessary when a man wants to take water?—There is a printed form of application, I think the Mambatdar issues it to village authorities or it can be obtained direct from the subordinates.

82. Q. To whom does the cultivator give it?—To the subordinate.

83. Q. Who is the subordinate?—He is a member of the Public Works Department.

84. Q. What does he do with it?—He sends it to the Executive Engineer.

85. Q. Then it is returned to the subordinate?—Yes.

86. Q. And then the subordinate lets the man know what orders have been passed?—Yes.

87. Q. How long does that take ordinarily—two months?—I am afraid there is apt to be a little delay, but nothing like two months.

88. Q. What does it take in ordinarily?—I cannot say.

[With regard to a remark made by Mr. Muir-Mackenzie as to the irrigable area on the Mhaswad tank, Mr. Beale explained that:—

(1) Irrigable area is that portion of the culturable area for which there is sufficient water available during the year;

(2) Culturable area is the area under command to which water can be led from a canal.]

89. Q. Did you see much of the irrigated areas during the famine?—I saw a good deal.

90. Q. Did you see anything of the wells near canals and tanks; was much good done by them?—Yes.

91. Q. Do you think they were substantially better off than wells at a distance?—Yes.

92. Q. In restricting the water-supply in Poona and arranging for distribution, have you had any trouble with the people?—No, I understand not, I have personally had very few complaints, Mr. Visvesvaraya is I believe getting the system into very satisfactory working order.

93. Q. You say in your note, "in Khandesh and Nasik people with lands under *bandarās* are constantly petitioning for storage works and improvements." Do you think there is any scope for that?—The Maladevi and Chankapur tanks are protective works for those districts.

94. Q. These are two instances of what is possible; has a general survey been made of the country to show what

is possible and what not?—Investigations have been going on for years and are still in progress.

95. Q. You know what is possible?—Yes, most of the possible sites have been investigated but details have not in all cases been worked out.

96. Q. Is much more possible besides those two tanks; is there any scheme for the improvement of the *bandhara* system?—I don't know if any general scheme is in hand but improvements are made from time to time as found desirable.

97. Q. Have you got all that is possible under consideration, or is there plenty of room for more?—I think what has been done pretty well exhausts the means of improvement so far as I know.

98. Q. Do you know Khandesh?—Not as well as the other districts.

99. Q. (Mr. Rajaratna Mdlr.)—If there is delay in getting sanction to applications for water and the *rayat* irrigates his land before the receipt of sanction, is he subjected to a penalty?—There is a double rate for taking water without permission.

100. Q. (The President.)—You don't require permission every season?—Yes.

101. Q. (Mr. Rajaratna Mdlr.)—Is such annual application necessary, do you think?—Yes.

102. Q. Why?—Because of the varying conditions of the sources of supply.

103. Q. I suppose you know the capacity of the tank and the area generally irrigated?—If you could depend upon the tank always having the same contents. One year you can accept a larger number of applicants than another, according to your supply.

104. Q. But taking normal years, why should you wish to have applications every year?—You get an idea of who is going to take water.

105. Q. Would it not be simpler to issue the water without fresh applications?—I don't think it would simplify the procedure very much.

106. Q. (Mr. Muir-Mackenzie.)—At what date have applications to be received?—15th October for *rabi* and 15th June for *kharif*, I think.

107. Q. (Mr. Ibbetson.)—Is there any date after which a man cannot get water, if he is ready to take it?—I cannot say. It depends on the supply.

108. Q. (Mr. Rajaratna Mdlr.)—Would it not be simpler if you had no annual applications?—I don't know how it would work; if you base your calculations on a normal year and have a bad year there will be complications.

109. Q. You say in paragraph 13, "the charges for maintenance and establishment are in some cases exaggerated by reason of the same establishment being employed on civil works." Is not the charge for establishment apportioned according to the amount expended? I don't know how the charges are made up.

110. Q. There must be some rule on the subject?—Yes no doubt.

111. Q. (Mr. Ibbetson.)—You said just now that, as far as you know, no special effort had been made to induce the people to take the 25 million cubic feet of water that was surplus in the Mhaswad tank; was the Executive Engineer asked for any explanation why this water was not used in a year of drought?—There was some correspondence with Government; the Executive Engineer gave certain reasons. I forget what they were; Government then sanctioned giving the water to the tank.

112. Q. I suppose the Executive Engineer interested himself in trying to get this water used and you as Superintending Engineer called upon him to explain why the water was going unused?—We have been so busy with the famine that there has been very little time for other matters.

113. Q. (Mr. Muir-Mackenzie.)—Do you think that famine labour has been employed as advantageously as it might possibly have been?—I think so.

114. Q. It has been employed on metal breaking?—Yes, but we have had the people as much on earthworks as possible; we had to begin with metal work.

115. Q. Why?—Because estimates were not ready and there was a difficulty in starting other works.

116. Q. If estimates had been ready for other work you would have preferred the labour to be employed on them?—Yes, for instance railway works and tanks.

117. Q. Is there anything you prefer to see famine labour on rather than tanks, in the special circumstances of your division?—No, I don't think so.

118. Q. Roads might be more advantageously made in Khandesh?—There is the difficulty of keeping up roads once they are made, I thought of *tals* or terracing on a large scale at one time, but we had not the establishment. A good deal of this is done by means of *takavi* advances.

119. Q. What is the great objection to terracing?—The difficulty of supervision and about huts and camps; we were hampered by rules about hutting, hospital, etc.

120. Q. It would be difficult to make requisite arrangements for large numbers?—Yes.

121. Q. Do you consider those difficulties insuperable?—I don't think so; if the question was thought out beforehand I think it might be possible to arrange; digging wells is out of the question, they don't give any work for carriers. I certainly think terracing might be tried, it is a very useful work.

122. Q. There would be no difficulty on the part of the cultivators in allowing it to be done?—That is a matter I have not considered, I don't think so.

123. Q. They don't make any difficulty about your taking land for bunds?—No.

124. Q. Is the extra expense in addition to that incurred on famine labour necessary to complete the tanks very heavy?—No. I may say that these tanks are excellent famine works, at the same time I prefer *tals* to tanks; we had to consider the question last year; tank sites are very limited now and we have exploited most of them; it is doubtful if we could go much further in this direction; small village tanks have not been tried to any extent and something more might be done in this respect.

125. Q. I understood from what you said that the selection of some of these tanks was due probably to the fact that there was no time for full consideration of all the conditions?—Yes.

126. Q. There was no time to consider if the tank was one that would be likely to fill?—One had to start work of some kind; the Hotgi, for instance, was one started under such circumstances.

127. Q. How would you remedy this state of things in a future famine?—I should have a special establishment to prepare projects; the Executive Engineer cannot do it in addition to his own work.

128. Q. You have programmes?—Only for metal breaking and roads, etc., and a few tank works.

129. Q. Should not the programme be of works of which the plans and estimates are fully sanctioned?—We have a good many projects not absolutely ready.

130. Q. Don't you think it would be a good thing to have them absolutely ready?—We should have a special establishment to prepare them.

131. Q. You think the best method is to have a special establishment?—Undoubtedly, there is no question about that.

132. Q. Have you been lately in the neighbourhood of the Nira Canal works?—Yes, a fortnight ago.

133. Q. Can you say from the appearance of the country the villages and cultivation, if there is a material increase in the prosperity of the tract?—Yes, most certainly, in the abundance of the crops and the appearance of the people and everything else.

134. Q. Did you happen to observe the yield of the crops; how does it compare with the yield on unirrigated crops in a year of good rainfall; do you think it is superior?—I should think it is superior; the *bajra* and *juar* are higher, but it is a long time since there has been normal rainfall.

135. Q. Is manure being used for grain and fodder crops?—I should think that where there is sugarcane they probably took most of the manure for that.

136. Q. That would probably exhaust the supply?—Yes.

137. Q. Coming to the question of applications; I suppose one reason for requiring applications is that in the case of a canal with a limited supply you must know the number of people who want it in order to be sure that the water is sufficient?—Yes.

138. Q. In the Mhaswad tanks we have a case of the supply not being taken up; why didn't you dispense with applications in that case?—No doubt it might have been

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Mr. Clifton. useful but was not thought of; I don't think it would do as a general principle for these works.

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139. Q. In the case where you have a tank from which the people don't readily take up the water that is to be had, don't you think it might be advisable to dispense with applications?—Yes, I think it might be tried.

140. Q. I suppose it is certain that this supply was given to the Pandarpur tank on this account?—I think it was simply surplus; we had to get the permission of Government.

141. Q. You cannot recall the reasons?—No.

142. Q. Has it ever occurred to you that the present system of distributing the water of a canal is susceptible of any material improvement, or are you satisfied with the system?—I think so at present, Mr. Visvesvaraya has laid out in the rules all the improvements which I think are possible.

143. Q. As to the crop rate system of assessment, are you satisfied with that?—We have to measure the land, etc.; that is one objection.

144. Q. How would you propose to do away with measurements?—By the introduction of *pots* or sub-numbers.

145. Q. (*Mr. Ibbetson.*)—If a part of a sub-number is irrigated do you charge for the whole?—Yes, that is our practice.

146. Q. What is the average area of a sub-number?—I cannot say.

147. Q. (*Mr. Muir-Mackenzie.*)—Is that the only improvement you would advocate?—I have not considered the question deeply.

148. Q. On the Nira canal, it being a protective work, every year a considerable amount of water is reserved to be given if necessary to crops that require perennial irrigation; that is you limit the perennial area in order to have a reserve for food grain in case of failure of the rains; do you think that is a good policy?—I think so.

149. Q. Do you think that it is essential for maintaining the protective character of the work; is there any other alternative; it has been suggested by some people that without essentially damaging the character of the work you might let out a larger quantity for perennial crops; is it a point on which you have any decided opinion?—No, I have no decided views.

150. Q. As regards provincialization of irrigation revenue and expenditure, that is not a point on which you have formed an opinion?—No.

WITNESSES NOS. 47 AND 48.—MR. RAMCHANDRA ANANT MODAK, Supervisor, and MR. SADASHIV VISHWANATH VAIDYA, Overseer, Public Works Department.

Answers to printed questions.

A.—GENERAL.

Messrs. Modak and Vaidya.

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1. The replies refer to the Násik District, excepting Sátara, Málegaon and Kalwan Talukas. We have been serving in this district respectively for the last three and nine years. Both of us had charge of Kádwa Canal Sub-division for varying periods.

2. Three statements of rainfall are attached hereto, two of them relate to famine years 1896 and 1899, and the third gives averages for the whole period for which information is available.

3. (1) None, so far as tracts requiring irrigation are concerned.

(2) No insufficiency of cattle.

(3) Irrigators are unable to obtain an adequate supply of manure with their limited means.

(4) Excepting hill tracts and black-cotton soil portion, in the eastern part of the district the soil is fit for irrigation.

(5) Yes, in case of *bandhárás*, which are classed as Second Class Irrigation Revenue works.

(6) No lack of funds in general. Given a good water-supply, credit can usually be got.

(7) None that we are aware of.

(9) The section of canal, as designed, generally proves insufficient to pass down an adequate discharge to simultaneously irrigate all crops in the tract under command. This retards growth of irrigation to a certain extent.

6. No, the area under irrigation being small as compared with the culturable area of the district, irrigation nowhere extends at the expense of *jiráyat* cultivation.

No such instances have come to our notice. The people have a strong desire for irrigation being extended to their fields.

B.—CANALS OF CONTINUOUS FLOW.

The works under this class are assumed to be those canals which are fed directly by river throughout the year. There are no such canals in the district.

C.—CANALS OF INTERMITTENT FLOW.

12. (1) The works under this head consist of canals fed by rivers and náilahs, and taken off from small weirs thrown across them.

(2) Water is distributed through channels by gravitation, and by lift in a few cases.

(3) Supply is maintained—

(a) to end of February or March.

(b) to end of November.

(c) only for a short period.

15 Irrigation is supplemented by wells in years of ordinary rainfall in the case of many *bandhárás*. These do

not hold a supply sufficient for the maturity of the crops. Rice and similar crops, under *bandhárás*, requiring waterings after every four to six days, need well water also, as the supply from the channel is often irregular. In case of chillies and khapla wheat well water is said to be more beneficial.

17. (1) In this district Government is the owner of such canals, and the annual rate per acre works out to Rs. 4.42 on the area of holding.

(2) Rs. 15 to 25 per acre as rent on the area under agreement.

(3) Not known.

(4) There are no such canals, as are owned by private persons, to our knowledge.

18. Private expenditure for bringing water to, and preparing, a field, is rarely incurred by landlord, but mostly borne by the tenant, who agrees to pay the rent inclusive of this. It is difficult to estimate it, as the tenant rarely employs hired labour. The landlord has sufficient security for recompense as the bond for rent includes the fulfilment of other obligations.

19. In no case damage has resulted to people on this account, but deterioration to soil has taken place in tracts, rich in black-soil, and in other fields, having insufficient manure, but profuse irrigation. The evil may be due to one or more of the causes, usually injuring the quality of the soil. So far as we know, lands have not been drained for removing the evil.

20. It is obligatory on the part of the irrigators to maintain their channels, banks, etc., in good order by annual repairs. Repairs and improvements to *bandhárás* are carried out by Government, 10 per cent. of the cost being contributed by the irrigators. All the *bandhárás* do not require repairs annually. The average annual expenditure incurred on their account (including contributions) was Rs. 13,000 up to 1890, and Rs. 4,500 per annum subsequently.

The system works fairly well, but is susceptible of improvements by a greater expenditure of funds. The obligations entailed on the irrigators are not carried out duly, which thereby renders the channels inefficient. The procedure to be followed, as per Section 25 of the Irrigation Act of 1879, involves considerable delay, which causes wastage of water and thereby loss of crops. To prevent this evil amendment in legislation is necessary to allow of immediate steps being taken.

22. Yes, in case of these minor works, by lending money, guaranteeing interest on capital, or by paying the owner a certain fraction of the water assessment.

D.—TANKS.

23. (1) The only tank in the Násik District is Wághad Tank, which is supplied with water from Kolwan river.

(2) Water is let out from this tank, into the Kolwan river, leading to the Palkhed Weir, 14 miles distant. It is further taken off for irrigation through the Palkhed Canal, which feeds the Ozar, Tambat and Wadali Canals, all having distributing channels suitably located.

(3) Supply is maintained—

- (a) throughout the year.
- (b) to end of March.
- (c) Do. Do.

(4) The several crops irrigated under the Kádwa Canals system, with present storage of Wághad Tank, varying from 262.35 to 338.95 mill. cubic feet, are, on an average for the last 14 years (as per statement attached) :—

	Acres.
Perennial	355
Eight months	926
Rabi	1,074
Monsoon dry	149
Hot weather	84
Miscellaneous	51
TOTAL	2,639

26. Irrigation is very rarely supplemented by that from wells in ordinary years. Wells are, however, necessary in years of drought or scanty rainfall. They are particularly necessary for preserving seedlings of perennial crops requiring transplantation.

28. The average annual rate paid on area irrigated by the Kádwa Canals system is :—

(1) Rs. 3.92 as average water-rate per acre on the area actually irrigated.

(2) Rs. 15 to Rs. 25 per acre as rent on area irrigated.

(3) No enhancement of revenue is paid on area irrigated by canals and assessed at water-rates, but on lands deriving benefit from water stored above the Palkhed Weir; the enhancement of Rs. 594, in total, per annum for portions of seven villages is paid.

29. Reply to question 18 holds good in this case.

30. The tank and canals are maintained and repaired by Government at a cost of about Rs. 1-8-0 per acre irrigated, including direct, executive charges, and tools and plant. The system works fairly well, but the punishment inflicted for any breach of canal rules, such as taking water without permission, results only in fines, and therefore does not prove deterrent. This results in injury to other cultivators having prior claim.

32. Construction of tanks should remain in the hands of Government as heretofore.

33. No inconvenience has yet been experienced in this district from the liability of tanks to silt up.

E.—WELLS.

34. The following table gives the required details for wells :—

Serial Number.	Question.	Nature of tracts.		
		Hilly.	Partly hilly and partly plain.	Plain.
1	2	3	4	5
(1)	Average depths of permanent wells	Rs. About 45'.	Rs. About 40'.	Rs. 30' to 40'
(2)	The nature of supply, whether from springs or from percolation, and whether liable to fail, or become too saline to use.	From percolation	From percolation and springs.	From springs.
(a)	in ordinary years	Supply lasts for about 8 to 10 months.		
(b)	in years of drought	Supply fails.		
(3)	Average cost of construction	1,000 to 1,200	800 to 1,000	600 to 800
(4)	Average duration of a well	Over 100 years.		
(5)	Manner in which the water is usually raised.	By	notes.	
(6)	Average area attached to and commanded by a well.	7 to 10 acres.		
(7)	Average area irrigated in any one year	Very rarely.	1 to 3 acres.	1 to 3 acres.

37. (1) Rs. 5 to Rs. 10 per acre as rent on the area attached to the well.

(2) None. Rates are paid on the total area attached to the well, and not on actual area irrigated.

38. Yes.

(1) To some extent.

(2) Difficulties are rarely met with in the actual construction of wells, except in the transport of explosives, which, according to standing orders, causes delay. Slight relaxation of these rules may therefore be effected. No assistance to cultivators in the manner referred to appears to have been given in this district so far as we know. It would therefore be advisable to keep a certain number of boring apparatus in each district for the use of cultivators, guaranteeing cost of repairs.

39. It may be shown that ultimately the cost of irrigation works per acre of area irrigated by a canal and of that

by a well, practically comes to the same amount. Wells, therefore, if constructed by Government, in tracts yielding water at reasonable depths would be more beneficial, as these do not injure the quality of the soil. It would therefore be advisable also to advance money at a low rate of interest to persons risking their private capital and guaranteeing the repayment of the advances. Experiments may be carried out by Government in sinking a few wells at Government expense. If the results prove beneficial, Government may in future pay in part the cost of construction for new wells; the rest to be borne by the interested parties. Expenditure so incurred by Government may be recovered by instalments later on.

40. Temporary wells are not in common use in this district. Their protective value is practically nil against drought. If they are to be of use in years of scanty rainfall, they should be deepened in ordinary years and maintained till years of scanty rainfall.

Monthly Statement showing Rainfall during the Famine year 1896.

Names of Stations.	Months.												Total.	REMARKS.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
	3	3	4	5	6	7	8	9	10	11	12	13	14	
Feint38	.00	.00	.00	.00	18.69	68.05	29.35	3.60	.08	.42	.05	120.62	} Ghát portion.
Igatpuri . . . . .	.00	.00	.00	.00	.38	30.05	79.35	46.40	4.99	1.11	.85	.00	163.13
Wághad . . . . .	.00	.00	.00	.00	.40	9.27	37.83	12.01	1.40	1.67	.00	.60	63.23
Wághad Tank Bungalow	Not registered.												...	} Within 30 miles from the Gháts.
Chachadgaon . . . . .	.00	.00	.00	.00	.02	11.79	43.40	22.27	2.58	.30	.10	.39	80.85
Násik . . . . .	.11	.00	.00	.00	.45	12.17	17.69	3.93	1.23	.51	.25	.00	36.34
Dindori . . . . .	.24	.00	.00	.00	.85	7.62	20.06	5.07	1.24	.18	.21	.14	35.61
Pálkhed . . . . .	.73	.00	.00	.00	.24	9.76	16.59	3.82	.40	.10	.00	.15	31.79
Sinnar00	.00	.00	.00	.00	7.61	11.80	3.78	.37	1.41	.09	.09	25.15	} Plain country.
Chándor . . . . .	.00	.00	.00	.00	1.67	9.72	12.06	2.70	.27	.08	.55	.38	27.43
Yeola . . . . .	.00	.00	.00	.35	.09	8.40	10.91	2.49	.63	.22	.06	.04	23.19
Niphád . . . . .	.00	.00	.00	.00	2.49	10.10	9.38	.61	.37	.00	.00	.52	23.47
Vinehár . . . . .	.00	.00	.00	.00	.15	3.36	10.81	2.33	1.08	.00	.00	.30	18.03
Khirdi Sathe	Not registered.												...	
Pimpalgaoon Baswant. . . . .	.00	.00	.00	.00	.53	8.37	16.50	2.48	.86	.15	.00	.18	29.07
TOTAL	1.46	.00	.00	.85	7.27	146.91	354.48	137.24	19.02	5.81	2.53	2.84	677.91	
Average11	.00	.00	.03	.56	11.30	27.27	10.56	1.46	.45	.19	.23	52.15	

Monthly Statement showing Rainfall during the Famine Year 1899.

Name of Station.	MONTHS.												TOTAL.	REMARKS.	
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
	1	2	3	4	5	6	7	8	9	10	11	12			13	14
Point00	.00	.00	.00	.10	2.19	20.10	7.51	6.68	1.64	.00	.00	.00	38.22	} Ghát portion.
Igatpuri . . . . .	.00	.00	.00	.00	.55	.00	28.75	21.84	11.22	2.42	.00	.00	.00	64.78
Wághad . . . . .	.00	.00	.00	.00	.88	.43	8.87	3.48	.75	1.78	.00	.00	.00	16.19
Wághad Tank Bungalow00	.00	.00	.00	.90	.30	10.72	6.11	3.14	2.72	.00	.00	.00	23.89	} Within 30 miles from the Gháta.
Násik . . . . .	.00	.00	.00	.00	.25	1.90	7.18	1.02	.89	3.31	.00	.00	.00	14.55
Chachadgaon . . . . .	.00	.00	.00	.00	.73	1.87	12.27	6.19	5.03	.81	.00	.00	.00	26.90
Dindori00	.00	.00	.00	.23	1.26	9.02	1.98	1.30	3.34	.04	.00	.00	17.17	} Plain country.
Pálkhed . . . . .	.00	.00	.00	.00	.00	.00	9.07	.36	.41	6.69	.00	.00	.00	16.53
Sinnar . . . . .	.00	.00	.00	.00	.02	.72	5.92	.77	.88	1.28	.00	.00	.00	9.59
Chándor . . . . .	.00	.00	.00	.00	.55	1.46	6.07	1.52	1.73	.83	.00	.00	.00	12.16
Yeola . . . . .	.00	.00	.00	.00	.05	.74	1.84	.54	1.02	2.89	.00	.00	.00	7.03
Nipbád . . . . .	.00	.00	.00	.00	.10	.87	1.96	.38	.52	1.00	.09	.00	.00	4.92
Vinchur . . . . .	.00	.00	.00	.00	.00	.65	2.80	.56	.63	.95	.00	.00	.00	5.59
Khirdi Sathe	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	
Pimpalgaon Baswant	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	Not registered.	
TOTAL	.00	.00	.00	.00	4.36	12.39	124.57	52.26	34.20	29.66	.13	.00	.00	237.57	
Average	.00	.00	.00	.00	.34	.95	9.58	4.02	2.63	2.28	.01	.00	.00	19.81	

Statement showing the Monthly Average of Rainfall during the period from 1877 to 1900.

Name of Station.	Period for which average is taken including both the years.	Months.												TOTAL.	REMARKS.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Peint	1884 to 1900 . .	.09	.09	.01	.03	.41	12.81	36.38	25.32	12.94	2.52	.80	.12	91.47	} Ghât portion.
Igatpuri	1877 to 1900 . .	.13	.02	.00	.05	.84	21.66	53.20	36.61	19.01	4.07	.29	.11	135.99	
Wâghad	1877 to 1900 . .	.05	.03	.05	.07	.84	7.80	18.21	12.38	8.27	2.74	.46	.20	51.10	
Wâghad Tank Bungalow . .	1898 to 1900 . .	.00	.21	.00	.30	.10	6.84	20.48	17.17	10.39	.00	.11	.11	55.71	} Within 30 miles from the Ghâts.
Chachadgaon	1894 to 1900 . .	.00	.07	.00	.12	.27	7.67	22.79	16.81	9.53	.91	.10	.14	58.41	
Nâsik	1877 to 1900 . .	.07	.06	.05	.17	.85	6.19	8.76	4.87	6.93	3.42	.32	.18	31.87	
Dindori	1877 to 1900 . .	.05	.05	.04	.14	.77	5.98	9.38	5.79	6.16	2.91	.43	.21	31.91	} Plain country.
Palkhed	1877 to 1900 . .	.07	.05	.05	.06	.80	5.93	7.96	4.77	6.24	3.16	.40	.13	29.62	
Sinnar	1877 to 1900 . .	.08	.04	.03	.23	.85	4.74	6.26	4.08	5.62	3.23	.45	.28	25.89	
Chândor	1877 to 1900 . .	.09	.04	.02	.04	1.23	5.73	6.38	4.47	6.82	2.43	.68	.26	28.19	} Plain country.
Yeola	1877 to 1900 . .	.13	.07	.03	.09	.74	4.29	4.41	3.15	6.68	2.08	.61	.30	22.58	
Niphâd	1877 to 1900 . .	.06	.02	.03	.00	.76	4.67	5.14	3.18	6.51	2.42	.53	.23	23.64	
Vinchur	1877 to 1900 . .	.01	.01	.01	.03	.16	3.50	4.82	3.11	7.02	2.68	.28	.20	21.63	} Plain country.
Khirdi Sathe	1878 to 1890 . .	.00	.00	.00	.02	.54	2.52	5.94	5.62	5.95	3.22	.22	.00	24.03	
Pimpalgaon Baswant	1880 to 1898 . .	.07	.05	.02	.10	.73	5.33	7.62	3.54	6.94	2.90	.57	.13	28.00	
TOTAL90	.81	.34	1.54	9.89	105.66	217.68	150.87	125.01	38.69	6.25	2.60	660.24	
Average06	.05	.02	.10	.66	7.04	14.51	10.06	8.33	2.58	.42	.17	44.00	

*Statement showing the Classification of Crops under Kadwa Canals, as per Statement III E. of
Irrigation Revenue Reports.*

*Messrs.
Modak and
Vaidya.*

18 Dec. 01.

Year.	Perennial.	8 months.	Rabi.	Monsoon dry.	Special hot weather.	Miscel- laneous.	TOTAL.
1	2	3	4	5	6	7	8
1886-87	450	629	457	108	...	143	1,788
1887-88	529	657	301	28	...	65	1,580
1888-89	649	550	1,141	4	17	136	2,497
1889-90	294	748	1,338	463	247	...	3,090
1890-91	245	751	815	284	132	...	2,227
1891-92	286	1,058	1,453	64	40	70	2,971
1892-93	275	810	1,544	63	101	32	2,825
1893-94	302	1,005	1,644	7	27	40	3,027
1894-95	375	998	1,052	188	110	44	2,767
1895-96	359	1,031	1,063	13	23	...	2,489
1896-97	336	1,285	1,574	32	110	66	3,403
1897-98	208	1,552	1,049	...	269	30	3,103
1898-99	293	990	1,240	49	47	39	2,658
1899-1900	371	897	372	784	53	43	2,520
TOTAL .	4,969	12,961	15,043	2,087	1,179	708	36,945
Average .	355	926	1,074	149	84	51	2,639

1. Q. (*The President*)—You are a Supervisor in the Public Works Department?—Yes.

2. Q. Where are you stationed?—At Násik.

3. Q. You say in your answer to question No. 3, "the section of canal as designed proves insufficient to pass down an adequate discharge to simultaneously irrigate all crops in the tract under command. This retards growth of irrigation to a certain extent." Will you please explain that; do you refer to canals in general?—Yes, the section is not large enough. If the section were larger we could give more water for a shorter time instead of a small and continuous supply.

4. Q. That only applies to where you have a tank or reservoir behind you?—Yes.

5. Q. It would not do for a *bandhára*?—No.

6. Q. What works have you got?—In my charge there is no irrigation work; there are only some *bandhárás*.

7. Q. You have no canals or tanks under you?—No.

8. Q. Where was your experience gained?—I was in charge of the Kadwa canals in Nasik.

9. What had you specially?—The Mhaswad tank in Sholapore.

10. Q. What area was under irrigation then?—I think in 1896 there were about 12,000 acres.

11. Q. Is the system of applying for water in vogue there?—Yes.

12. Q. They are not allowed to take it without sanction?—No.

13. Q. Are they fined if they do?—Yes.

14. Q. After a man has sent in an application, when does he get a reply?—It takes about a month; in urgent

cases permission is given as soon as the application is received in the Sub-Divisional office.

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15. Q. Is it refused ever?—Very seldom.

16. Q. Do you think it is necessary to have an application?—Yes, otherwise anybody would take water.

17. Q. But there are Inspectors to look after it?—Yes.

18. Q. Do you think people would take irrigation more readily if there was no application required?—Yes, but it would not pay.

19. Q. Have you had experience of more water than you know what to do with?—No.

20. Q. Was the whole of the Mhaswad tank water taken in 1896?—Yes.

21. Q. (*Mr. Muir-Mackenzie*)—Was not some given to the Pandarpur Municipality?—Not in 1896.

22. Q. (*The President*)—You say in paragraph 20, "it is obligatory on the part of the irrigators to maintain their channels, banks, etc., in good order by annual repairs. Repairs and improvements to *bandhárás* are carried out by Government, 10 per cent. of the cost being contributed by the irrigators." Is that rule about 10 per cent. regularly in force?—I think so.

23. Q. Suppose a cultivator refuses to pay, what then, is he put in prison?—I am not aware of such a case like that; I have never heard of a man refusing to pay.

24. Q. Then you go on to say, "the system works fairly well, but is susceptible of improvements by a greater expenditure of funds. The obligations entailed on the irrigators are not carried out duly, which thereby renders the channels inefficient." Will you explain what you refer to?—The silt is not properly cleared in time and therefore the discharge is interfered with.

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25. Q. Do your overseers or subordinates look after the work when it is being done by the villagers?—No.

26. Q. Is there anybody to see to it?—No.

27. Q. They are left to themselves?—Yes.

28. Q. How do they know what to clear?—They clear away the soft silt.

29. Q. Have you had anything to do with the Waghad tank?—Very little; I only once saw it.

30. Q. You say on page 4, "difficulties are rarely met with in the actual construction of wells, except in the transport of explosives." What do you refer to?—Gunpowder.

31. Q. Is that difficult to get in villages?—Yes.

32. Q. You say on page 5, "it may be shown that ultimately the cost of irrigation works per acre of area irrigated by a canal and of that by a well, practically comes to the same amount. Wells, therefore, if constructed by Government in tracts yielding water at reasonable depths, would be more beneficial as these do not injure the quality of the soil." Do you think Government should construct a number of wells?—Yes, at least to begin with, to show the people how advantageous they are and how they should be made.

33. Q. Do you think the number of wells might be increased very largely?—If takavi advances are given and the rate is reduced.

34. Q. Is there any difficulty about takavi advances?—There are some delays.

35. Q. Do you think more advances would be taken if it was made easier?—Yes.

36. Q. How would you suggest to do it?—By showing the people how to bore for water; by spreading the recovery of advances over a larger number of years; and by reducing the rate of interest.

37. Q. Do the people complain of the interest charge on advances?—I have not heard them.

38. Q. (Mr. Higham)—Applications for water are not made in the case of *bandhārās*?—No.

39. Q. On what works are these applications made?—Only on 1st class works, as in the case of the Kadwa river works.

40. Q. Supposing a number of owners made an application once for all, would they be able to distribute the supply among themselves every year without application?—I don't think so; The area and the crops and their location in a particular survey number often vary from year to year; therefore, applications received one year cannot serve as a guide for regulating the supply next year. The cultivators are moreover scarcely able to make a common cause.

41. Q. We clear the channels now?—No, not in the minor distributaries.

42. Q. Are you speaking of the Kadwa canal?—Yes.

43. Q. The people have to clear their minor distributaries?—Yes.

44. Supposing a number of the members of a village asked for water, would they not be able to take water without going every year to canal officers and to make their own arrangements for its distribution in the same way as people do on *bandhārās*?—That has not been tried anywhere.

45. Q. Do the people clear their *bandhārās*?—Yes.

46. Q. Then why don't they clear their minor channels?—They don't as a matter of fact do it; when applications are received and the channels are in bad order we issue a fortnight's notice that the water will be stopped and then stop the supply if the channel is not cleared.

47. Q. Do they clear it after they get a notice of that sort?—Yes, generally.

48. Q. They clear it if they want the water and don't if they don't want the water?—Yes.

49. Q. You say repairs and improvements to *bandhārās* are carried out by the Government, 10 per cent of the cost being contributed by the irrigators?—Yes.

50. Q. They also have to do their petty repairs?—Yes.

51. Q. What are the works that Government do?—Such improvements as escapes, etc.

52. Q. And they always take 10 per cent.?—Yes.

53. Q. Do you think that canals injure the quality of the soil?—Yes. By water-logging; it gradually becomes useless for cultivation.

54. Q. Has any land gone out of cultivation?—Yes, in the Kadwa canal system.

55. Q. What crops do they grow there?—Dry crops.

56. Q. What did they cultivate before in the land that has got water-logged?—Ordinary crops; the outturn is very poor.

57. Q. Is that due to want of manure or excess of water?—Probably to excess of water.

58. Q. Where there is well irrigation there is no danger?—No.

59. Q. (Mr. Rajaratna Mdlr.)—Referring to the system of applications for water, to whom does the *raiyat* apply?—To the Inspector and then it goes to the Sub-Divisional office.

60. Q. And then to the Executive Engineer?—Yes.

61. Q. Is there any time fixed for presenting the application?—Generally a week or so before the water is required.

62. Q. No time is fixed?—No; I think they should be submitted a fortnight before the necessity for water arises. It is never rejected, unless there is no water.

63. Q. Then what is the necessity for the application?—Anybody might take water. In one year he might have one survey number and then it may change; in one year he might have one crop, in another year another.

64. Q. How do you regulate the quantity of water required?—By ascertaining the total approximate area of the various crops under irrigation, and by calculating the quantity of water required.

65. Q. Are the *raiyats* prosecuted if they irrigate before sanction?—I have not heard of that being done; we fix a double assessment, that is all.

66. Q. (Mr. Muir-Mackenzie)—Is that penalty often imposed?—Yes, it has to be imposed in many cases, at least in famine years, scarcely in normal years.

67. Q. (Mr. Rajaratna Mdlr.)—Had you any experience of the last famine year?—Yes.

68. Q. On what work?—On the Mhasvad tank in Sholapur.

69. Q. On the Mhasvad tank the working expenses are Rs. 18,000 and the revenue Rs. 19,700; why are the working expenses so high?—The canal is so scattered.

70. Q. In that tank the duty is only 52 acres per cubic foot per second, why is it so low as compared with other works?—The irrigation is very scattered, and there is a great deal of percolation and waste in transit.

71. Q. On page 3 at the end of paragraph 20 you say, "to prevent this evil amendment in legislation is necessary to allow of immediate steps being taken." In what direction?—That notices may be dispensed with—canal water being stopped at once.

72. Q. (Mr. Muir-Mackenzie)—Was the Mhasvad tank ever quite full in your time?—Yes, it was full in 1893 and floods passed over the waste-weir.

73. Q. Was it capable of irrigating the full 24,800 acres?—No, 12,000 acres were irrigated.

74. Q. The water in the tank was not sufficient?—No.

75. Q. In 1894-95 what was the state of the tank?—It was full.

76. Q. Why was water not taken then for 12,000 acres?—It was perhaps a little less.

77. Q. The average is only 5,000 a year. Why is so little water taken?—Perhaps the waste-weir was reduced.

78. Q. In eight years the average amount irrigated was 6,000 acres?—I think the lowness of the area was due to lowness of the waste-weir; besides there is great leakage.

79. Q. In ordinary years is all the water available taken?—Not much remains at the end, as far as I remember.

80. Q. You don't think there is any reluctance on the part of the cultivators to take the available water in an ordinary year?—No.

81. Q. What was the first year you went to the Mhaswad tank?—In 1895.

82. Q. In that year only 3,400 acres were irrigated, why was that?—The waste-weir was low.

83. Q. Was all the available water taken?—I don't remember.

84. Q. (Mr. Ibbetson).—What is the depth of the black-

oil which you irrigate from the Mhaswad tank?—Perhaps 1 to 3 feet. Mr. Modak.

85. Q. It has *muram* underneath?—Yes. 18 Dec. 01.

86. Q. When you speak of the leakage, do you mean that your channels cut into the *muram* or that the soil takes more water?—Both.

87. Q. In 1895-96 the level of the waste-weir was low; in the subsequent year the area was more than double?—Every year two feet was added to the waste-weir and so it was gradually built up.

WITNESS NO. 48.—SADASHIV VISHWANATH VAIDYA, Overseer, P. W. D., Nasik.

1. Q. (The President).—You are an Overseer in the Public Works Department?—Yes.

2. Q. You are stationed at Nasik?—Yes.

3. Q. Have you had charge of any tanks?—I was in charge of the Kadwa Canal Sub-Division for seven years.

4. Q. How much had you under the canal?—The average is from 2,000 to 3,000 acres.

5. Q. What is the soil?—Blackish-red.

6. Q. Not deep black cotton soil?—No.

7. Q. Have you had the Waghda Tank under you?—Yes.

8. Q. Do they send in applications for water in your parts?—Yes.

9. Q. Is that necessary?—Yes.

10. Q. Is the water all consumed, or is there more water than you require?—At present the tank is not fully developed, it is mostly consumed.

11. Q. Do you think if the tank was fully developed there would be too much water?—Almost all the storage would be consumed.

12. Q. The water is taken every year?—Yes.

13. Q. Does it go into any small tanks?—No.

14. Q. If you want to protect the place from famine

would you make wells or a canal?—If there is a possibility of making a canal, it is better than wells.

15. Q. You say in paragraph 39 of your Note "Wells therefore, if constructed by Government in tracts yielding water at reasonable depths, would be more beneficial, as these do not injure the quality of the soil." What is the injury to the quality of the soil from canals?—Under canals irrigators use too much water, which washes away the beneficial soluble salts in the soil.

16. Q. Could you not put any check upon that?—No.

17. Q. Do you think Government should make the wells?—No; they may help the irrigators to make the wells by takavi advances.

18. Q. Do many apply for these advances now?—So far as I know very few, probably the conditions of takavi do not suit.

19. Q. What is the difficulty?—They should be allowed a longer period to return the instalments.

20. Q. What would you like?—About 10 to 20 years.

21. Q. How long do they get now?—I am told only ten years.

22. Q. Do you think if it was made 20 years many people would apply?—Perhaps.

23. Q. Is there any other way in which it could be made more popular?—Not as far as I know.

Mr. S. V. Vaidya.

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WITNESS NO. 49.—MR. GANESH SAKHARAM KHARE, Sub-Engineer, Malegaon, Nasik District.

Memo. by Witness.

The following report refers to Pimpalner, Dhulia, Sindkheda, Amalner, Shahada and Nandurbar talukas of the Khandesh Collectorate, and Kalwan, Baglan and Malegaon talukas of the Nasik Collectorate, and is made by Sub-Engineer Mr. Ganesh Sakharan Khare who had the opportunities of personal experience of nine years in the district during his service in Khandesh Irrigation.

In the first place I beg to bring to notice that in giving the following information I have limited myself to the only question of old Irrigation in the district.

In these parts the rivers and even small nullahs have perennial supply of water which is picked up by the construction of small masonry dams called locally "*bandhās*" for which channels, varying from a few hundred feet to three miles, are constructed and lands belonging to one or more villages are irrigated. Irrigation on a large scale on any one channel is not attempted. The total area irrigated by the above system is nearly 24,000 acres, bringing in a consolidated revenue of land and water shares amounting to Rs. 2,02,000, of which Rs. 32,000 is land share and Rs. 1,70,000 water share. Instances of two rivers, viz., the Aram and the Mosam, are taken to show the quantities of water which have been taken advantage of, by the system of these *bandhās*. The catchment area of the river at the last *bandhārā* on the Aram is about 170 square miles while the irrigation on the same is 2,375 acres, of which nearly one-fourth is high class irrigation of sugarcane. Ordinarily six acres are taken as irrigable for every million cubic feet of water stored up in a reservoir, which can be kept under control.

In the present case the area is irrigated by taking advantage of the storage as it were, of underground springs. It would not be much out of the mark if I take that for every three acres irrigated one million cubic feet of water is used.

By this assumption a storage of about 800 millions cubic feet of water is required for the irrigation of these 2,375 acres in a catchment of 170 square miles. This is equal to the storage due to a run-off of two inches on the above catchment. Similarly the Mosam has a catchment of 380 square miles at the last *bandhārā* and the area irrigated is 5,808 acres and this at three acres per million cubic feet would be equal to a storage of about 2,000 million cubic feet, or

equal to a run-off of 2.2 inches over the catchment as utilized. It will therefore be seen that the soil along the tributaries of the Tapi taking their rise from the Western Ghats has a very great power of absorption and retention of the rains. It follows therefore that the soil in Khandesh Irrigation District is in great contrast with laterite soil, which absorbs much water like a sponge, but at the same time gives it out immediately without retaining it in its interior, also not like *muram* soil which has less power of absorption, nor like black cotton soil which absorbs water in few feet below surface only, but does not contribute to underground storage. These *bandhārās* and channels seem to have been constructed when Mahomedans were the rulers of Khandesh District, and in making these channels good many tunnels through yellow soil have been constructed, which seems to be a peculiarity of Mahomedan construction, as may be seen in the water works of Mahomedan period made at Junnar, Aurangabad and other places.

It will be seen that now-a-days whenever any water work for a town supply or irrigation purposes is contemplated, a tank or a reservoir drawing its storage from surface water is generally first thought of. So during Mahomedan times taking advantage of underground storage seems to be their first consideration. They have gone even to making conduits from underground springs for purposes of irrigation as may be seen from the "Hapising" conduit near Junnar supplying water to about 30 acres of irrigation made by an Abyssinian slave of Chand Bibi of Ahmednagar dynasty.

Absorption is looked upon as so much loss to irrigation and no doubt it is so to the overground reservoirs, but for underground reservoirs it is so much gain. Anything done to increase absorption will help these works.

It would appear to a superficial observer, seeing so much underground supply in the vicinity of towns like Dhulia, that tapping underground supply would have perhaps given a better filtered supply to the town. And it may be seen if it is not possible to come across a sufficient supply for Malegaon and other towns in the basins of the Panjharā, the Mosam and the Girna Rivers, if water works are to be proposed for them.

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The Mahomedan Rulers did not stop by constructing works for utilizing underground water, but they tried to construct tanks also, but failed in the attempt. No less than 30 tanks were constructed in Nandurbar Taluka alone, but all of them have breached.

There are a large number of hills near Nandurbar and other places south of Tapti which run parallel to each other and at right angles to general drainage of the country giving passages to all the rivers and nullahs, large and small. The gorges are very narrow, and large tanks can be constructed at a very small expenditure. The difficulty is about waste-weirs and the failures of so large a number seems due to this rather than any other cause. These hills are eminently suited for the construction of tanks. A look at the topographical sheets of Nandurbar, Dhulia and others will show what a large number of tanks are possible. The old tank of Gondar is near Dhulia on this sort of range, so was Wadi Bhokar Tank, which breached after the floods of 1896. Ta'wada Tank, constructed in the last famine, is in the same sort of hills, so are the proposed tanks like Dudhala, for Nandurbar water supply, Chopala and Raitel tanks. A

large tank in Kathiawar, I am told, has been constructed in the same sort of hills. It would be worthwhile to consider the restoration of the old tanks and construction of new tanks. It would increase the direct irrigation and also indirect irrigation by increasing the underground supply. Large tanks will do much good, but small tanks would be useful as small famine relief works.

Forests are a great help to the old irrigation work by preventing denudation and by increasing absorptive quality of the ground, but their utility may considerably be increased by constructing small tanks not so much to hold water but to improve the forest land. This would give great work to famine labour on small scales. This would prevent the washing away of rich mould prepared by the great agencies of the sun and the atmosphere during the year. Absorption will be increased as rain water will tarry a while before it finds its way by the waste-weir provided, and the growth of forest will considerably increase on the new reclaimed area. I would go so far as to propose making temporary tanks of Mr. Strange's design with small outlets discharging in 24 hours whatever run-off has been gathered in the tanks in a couple of hours.

1. Q. (The President.)—You are Sub-Engineer of Malegaon?—Yes.

2. Q. How long have you been there?—For about nine years.

3. Q. You say you confine yourself to the question of old irrigation?—Yes.

4. Q. That is to say you have had nothing to do with recent irrigation?—No. I have been for the last nine years making small projects and looking after repairs of old irrigation works.

5. Q. You say "ordinarily six acres are taken as irrigable for every million cubic feet of water stored up in a reservoir." Do you say that from your own observation?—That is the way we calculate.

6. Q. You say "in the present case the area is irrigated by taking advantage of the storage, as it were, of underground springs." Do you mean the *bandhāra* system?—Yes.

7. Q. Then you say "it would not be much off the mark if I take it that for every three acres irrigated one million cubic feet of water is used?—Yes, so much goes to waste, whereas some land could be irrigated by that water.

8. Q. Where does it go to? Is it not picked up by a *bandhāra* lower down?—Up to November or December it is not picked up, it goes to waste. In December and January the people generally close their *bandhāras*.

9. Q. It goes to waste because they do not want it?—Yes.

10. Q. People do not want irrigation before December?—The water-supply is ample without the *bandhāras*.

11. Q. If they did not close them, could they not supply water to more land?—Yes, they could.

12. Q. They do not care to?—No, because they cannot irrigate high class crops.

13. Q. And they do not irrigate *juari*?—No.

14. Q. Cotton?—No. They irrigate first rice, secondly sugarcane, thirdly wheat and afterwards *bajri*.

15. Q. Do you think it would be of any use giving them more water, if they do not care about it?—We might try.

16. Q. What happened when the rain failed?—They took water for grain crop.

17. Q. Did you supply very much water in Nāsik during the famine?—Yes.

18. Q. What do you think is the best thing for Government to do to protect the district against another famine?—In some places I would recommend irrigation works. The Girna reservoir would help the Malegaon taluka.

19. Q. Would the people take water?—Yes.

20. Q. You say they do not care for irrigation except for high class crops?—They irrigate high class crop ordinarily but they take it for grain crops when there is drought.

21. Q. What are the high class crops they cultivate?—In the Nasik Collectorate in the first year they cultivate rice, second year sugarcane, third year wheat and then *bajri*.

22. Q. What is the proportion, half of wheat and *bajri*?—Yes. It is a quadruple rotation.

23. Q. You do not call *bajri* a high class crop?—No; neither wheat.

24. Q. You think the extension of irrigation would help them?—Yes.

25. Q. What area is there in Nasik that is irrigable. How many acres?—I have not got the statistics.

26. Q. Could you irrigate one-fourth of the district or one-tenth?—One-tenth, most of the hilly portion cannot be cultivated.

27. Q. Do you think that that would help very much in times of famine?—Yes. There was a great difference in the sufferings of the irrigated and non-irrigated villages.

28. Q. (Mr. Higham.)—You say "similarly the Mosam has a catchment of 380 square miles at the last *bandhāra* and the area irrigated 5,308 acres and this at 3 acres per million cubic feet would be equal to a storage of about 2,000 millions cubic feet?—Yes.

29. Q. That is the quantity of water stored in the tank?—Yes.

30. Q. It is supplemented by a further supply from the springs in the river and by the perennial flow of the river?—Yes, in a few cases that is the case, but generally in tanks like the Mhasvad there is no flow.

31. Q. Is not a great deal of irrigation done by the flow of the river before the river falls without drawing on the storage tank?—Yes.

32. Q. They do not draw water from the storage tank until October or November?—In small tanks they do even in the monsoon, if there is sufficient water; but not from tanks which are not fed by a perennial stream.

33. Q. Supposing a man wants to make a new *bandhāra* below an existing one, is he allowed to do so?—There has been no objection made, at least as far as I know.

34. Q. No new *bandhāras* are made?—No.

35. Q. These *bandhāras* are old ones?—Yes, they were made a long time ago.

36. Q. Suppose when you come to the lowest *bandhāra* there is a lot of water running over, can any body pick up that water?—I do not see any objection to that.

37. Q. Supposing any one wanted to make a new dam to pick it up, is there nothing to prevent him?—No.

38. Q. Do you know of such a case?—No.

39. Q. Is it because there is no water to pick up or because it is not the custom?—Because they cannot spend so much money on *bandhāras*.

40. Q. Are there any places at which, if they could spend the money, they might be able to pick up more water?—There are a few places on the Panjra. Near the Aram river there is a *bandhāra*. The people try to divert the water to another nullah from it.

41. Q. Both these rivers have surplus water?—Yes.

42. Q. All through the year?—The Aram has all through the year.

43. Q. You say about Nandurbar there is a site for a tank?—Yes. There are parallel hills at right-angles to the water course.

44. Q. You speak of a great many tanks made by the Mahomedans in the Nandurbar taluka being breached?—Yes, and rendered useless.

45. Q. Why?—For want of a waste weir.

46. Q. It is quite possible to make new tanks there?—Yes.

47. Q. Could those old tanks be repaired?—Yes; estimates were made by Lieutenant Hart some years ago but the work was not carried out.

48. Q. No tanks have made up recently?—No, only the Talwad tank was made in the last famine; it was an old tank re-made.

49. Q. Are there any land owners in this district who make tanks themselves?—I do not think they are rich enough to build tank.

50. Q. (*Mr. Ibbetson.*)—You speak of underground storage tunnels?—Yes. There are many tunnels which are underground. There is one at Jagakhad they have limed it; I do not know when it was made. Perhaps shortly after the British conquest.

51. Q. What is it supplied from?—From the Masal river. *Mr. G. S. Khare.*

52. Q. How did they come to make underground tunnels?—The bank is so high that instead of making an open channel they have made an underground passage in the yellowish soil.

53. Q. You say tanks can be easily made at a very small cost?—I think so.

54. Q. Do you think the people will use the water?—Yes.

55. Q. Would they have used it before the famine or will they use it as a lesson from the famine?—Tanks have been used for irrigation purposes for a long time.

56. Q. Only very few?—No. Almost thirty tanks.

57. Q. Why has not Nasik been covered with small village tanks if the people are used to irrigation?—I cannot say. Estimates were prepared for the construction of village tanks.

Mr. G. S. Khare.
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WITNESS NO. 50.—*MR. RAMCHANDRA CHINTAMAN KHARE, Pleader, Shirpur.*

Answers to printed questions.

2. (a) As to gross and culturable area in the district of Khândesh, I cannot give definite figures, as I have got no statistical registers with me.

(b) Khândesh soil is on the whole a good soil, though it cannot be properly described as rich black loam. The soil is not generally moist for want of sufficient rains. It has got, however, a great power of absorbing and retaining moisture.

(c) The average rainfall per year varies from 15 to 30 inches.

(d) The south-westerly monsoons give but scanty rains, and artificial irrigation is found a necessity.

(e) Wheat, gram, rice, bajri, plantain, and sugarcane generally require irrigation.

(f) Wheat and rice crops require watering every eighth day. Sugarcane requires it every fourth day and bajri every fifteenth day. Of course this rule varies, as the capacity of the soil to absorb moisture is greater or less.

(g) Gujarât has generally insufficient rains.

(h) As a rule the cultivators irrigate their garden lands all through the year. Some crops, however, only require watering for about four months from October onward.

(i) The distribution of water is controlled by the Government officers specially appointed for the purpose. In years of drought the canals dry up, and crops consequently suffer a good deal.

3. (a) Small tanks may be constructed on Khândesh soil, and earthen dams without masonry work would do when the extent and the size of the tank are not very great. Khândesh soil is not very rich, and hard soil can be got about 4 or 5 feet below the surface. A dam about 7 feet in height with stone-pitching on the surface is sufficient to hold water.

(b) In Khândesh land requires artificial irrigation even in good seasons, for generally the rainfall is insufficient and scanty. Besides all lands necessarily require artificial irrigation from October onward, and Government is not at all likely to suffer, from financial point of view, owing to slack demand for canal water.

(c) All land-holders of black soil are desirous of having an irrigation work on or about their soil, and they are sure to take the best possible advantage of any tank that might be constructed on or near their lands.

4. In Shirpur taluka of the Khândesh district there are many sites where canals might be conveniently constructed at a comparatively small outlay. At Kervand in the said taluka the site is a grand one, and a tank constructed there will provide water to the whole taluka. Plans and estimates are already made and the project has been approved of by Government.

To questions 5th and 6th I cannot give any definite answer for want of statistical information.

7. (a) Although in a famine year the number of wells increases, the total area irrigated is less than in ordinary years.

(b) I cannot give exactly the number of wells constructed in the last decade, nor can I specify the cases in which Government help was given.

(c) It is certainly desirable that Government should encourage in all possible ways the construction of new wells and should advance *tagai* in cases where it is found necessary.

(d) In the years 1899, 1900, and 1901 the rainfall was insufficient, and the consequence was that many wells got dried up and the people had to abandon them.

(e) In Khândesh the depth of underground water varies from 30 feet to 80 feet, the depth increasing with the quality of the soil.

(f) The average annual expense for one well with one *mot* is about Rs. 250 and the annual income is about 300 to 350. The number of acres watered by one well with one *mot* varies from 2 to 4 acres, the area irrigated being the greatest when the quality of the soil is the poorest.

(g) I have no personal knowledge about artesian wells and their possibility in Gujarât.

8. (a) Crops at times suffer from more than necessary rain when the soil is rich. But these occurrences are so scarce that no consideration need be given to them.

(b) In this district there are very few lands which suffer from water-logging, and consequently no expenses are necessary in that direction.

9. In Khândesh people were employed in the last famine, on road-metalling and road-making. The earthwork of Shirpur-Chopda Road was completed in the last famine, but no further steps were taken to metal the road and make it complete. The consequence is that the road is not completed and is damaged by rainfall.

10. (a) In Khândesh no programmes have been prepared before the famine set in, and a good deal of time was spent before works were settled upon and opened for work.

(b) In the last famine two plans have been approved of in case any more famine visits the district.

11, 12, 13. I cannot give any definite answers to these questions.

14. The protective value of irrigation works in the last decade is not very great. Irrigated lands are taxed very heavily, irrespective of the consideration that the canal water is insufficient in years of drought. People reared up valuable plants such as *limbu*, *santra*, guavas, etc., under the expectation that the water-supply would be sufficient to maintain them in all years. That expectation not being realised, people were put to great and permanent loss when the sudden drying up of the canal destroyed their valuable plants.

Mr. R. C. Khare.
18 Dec. 01.

1. Q. (*The President, through Mr. Muir-Mackenzie as interpreter.*)—What is the rainfall in Kervand?—From 15 to 30 inches.

2. Q. Can you read the gauge?—Yes.

3. Q. Were any plans passed for the Shirpur and Kervand projects?—Plans were prepared by Mr. Karpur (the Executive Engineer) about two years ago for Kervand only. But I do not know the particulars.

Mr. R. C.
Khare.

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4. Q. They are situated in the west?—Yes.
5. Q. Do you think these two works will supply the whole taluka with water?—Yes; Kervand will supply the whole taluka except the hilly tracts.
6. Q. Do you believe in the irrigation of black cotton soil?—Yes.
7. Q. Even if it is deep?—Yes. If in the light cotton soil five acres are irrigated by one *mot* only half the area would be irrigated by it in deep black cotton soil.
8. Q. (Mr. Higham).—You say a well of one *mot* costs about Rs. 250, for its working throughout the year; has that been your own experience?—Yes.
9. Q. Can you give us details?—Yes.
10. Q. What are they?

	Rs.
1 pair of bullocks cost Rs. 100—Capital charge for depreciation and interest	20
Farm servants	125
Agricultural labour	30 to 40
Grass for cattle	50 to 75
Mots and raising apparatus	25
Total	285

11. Q. (Mr. Ibbetson).—What is your profession?—I am a Pleader.

12. Q. How much land do you own?—About 1,200 to 1,400 acres.

13. Q. Do you belong to an agricultural family?—No.

14. Q. (Mr. Rajaratna Mdlr.).—Do you lease your land or do you cultivate it yourself?—I cultivate some and let some to tenants.

15. Q. What rent do you get from your tenant?—It varies from year to year; for the 1,000 acres that I have let to tenants, I get about Rs. 1,200 as rent, of which Rs. 200 to Rs. 300 are received in cash and the balance in kind.

16. Q. If you take it in money how do you fix it approximately?—According to the quality of the soil. If I take half the produce that would sometimes mean considerable gain and sometimes loss, especially for land higher up in the hills.

17. Q. Can you tell us on an average what percentage the land yields on the outlay?—About $7\frac{1}{2}$ percentage, but in some cases the land is naturally good, and in others we have to spend money on improvements.

WITNESS No. 51.—MR. NARAYAN VISHNU, Supervisor, Poona Irrigation.

Answers to printed questions.

I.

A.—GENERAL.

1. The answers below refer to Poona District (Parandhar Haveli, Bhimthadi and Indapur Talukas). Having been solely in charge of Irrigation works (construction and administration) for the last 23½ years, I have had opportunities to see personally into all the details of irrigation management.

3. (1) There is no obstacle for extension of irrigation from sparsity of population.

(2) Insufficient supply of cattle does not form an obstacle to the extension of irrigation.

(3) Insufficiency of manure is a considerable obstacle to the extension of irrigation.

(4) Unsuitability of soil has not much to do with the extension of irrigation.

(5) Uncertainty of the supply of water or its too late commencement or too early cessation does in some way form an obstacle to the extension of irrigation.

(6) Lack of capital for the initial expenditure or of funds for the more expensive cultivation of irrigated crops very considerably interferes with the extension of irrigation.

(7) Fear of enhanced rent or revenue assessment does impede the extension of irrigation.

6. The extension of irrigation has not yet tended to injure remaining cultivation by attracting its cultivators to the irrigated tracts.

There is a very strong desire evinced among the people of this district to have the means of irrigation extended to it or increased.

B.—CANALS OF CONTINUOUS FLOW.

7. (1) The value of the produce of land is increased by 25 per cent. by cultivation of two harvests instead of one.

(2) By the substitution of more for less valuable crops the increase in the value of the produce is about 60 per cent.

(3) (a) In a year of ample rainfall the value of the produce of land is not increased by irrigation to any appreciable extent.

(b) In a year of scanty rainfall the value of the produce of land increases by irrigation by 100 per cent.

(c) In a year of drought the value of the produce of land increases by about 150 per cent.

8. The increase in the total annual value of the produce per acre due to the irrigation (1) on the average of a normal term of years is Rs. 50 and (2) in a year of drought Rs. 77 per acre.

9. (1) Annual rate per acre paid on account of irrigation by the cultivator to the owner of the (canal who in this district is Government) is Rs. 3½ on area actually watered.

(2) Rs. 5 per acre of the actual area irrigated or the area of the holding is the average rate of payment by the cultivator to the owner of the land in the form of enhancement of rent. Sometimes this rate rises up to 10 to 15 rupees per acre, depending upon the conveniences of cultivation, such as proximity to markets or centres of population.

(3) Rs. 3 or thereabouts are paid by the owner of the land to the Government in the form of enhancement of revenue or water advantage rate on the whole irrigable area.

10. Twelve annas per acre for the initial cost to bring the water to the field and four annas for periodical repairs is necessary and Rs. 16 for preparing the land for irrigation. This expenditure is always incurred by the tenant. Prospective increase in the value of crops is the only security for recoupment.

11. Damage is done to the soil from irrigation without manure, also from too profuse or too frequent watering and also from water-logging or salt efflorescence. This also affects the health of the people residing in close proximity to such lands. The form of the deterioration of the soil is the loss of its fertile property. The extent of the deterioration will increase with the continuance of irrigation under the above-mentioned circumstances. The cause of the deterioration is the disappearance of nutritive or introduction of injurious elements. The remedy for preventing the deterioration is by—

- (1) Replacing the lost nutritive elements.
- (2) Stopping profuse and frequent waterings.
- (3) Change of crops.
- (4) Introduction of improved drainage works.

The irrigation is of 16 years' standing, and the evil sprang from it 12 to 13 years and is almost stationary. Crops on lands provided with drainage are much better than crops on lands without drainage.

C.—CANALS OF INTERMITTENT FLOW.

12. (1) The manner in which the Vir Nulla canal and other groups of canals at Jeur, Walah, Parincha and Manki Nallahs in the Parandhar Taluka of the Poona District are supplied with water is as under:

A small temporary bund is thrown every year at the close of the monsoons, or at such times which necessitate irrigation. The position of the bund is generally at the head of a drop in the nallah bed so that a channel cut from the side of the bund can take water to the land along the banks of the nallah or to fields which can be commanded by the channel.

(2) The distribution of water to the lands commanded by the above-mentioned channels is made according to the areas to be watered during a period of rotation, which is generally taken to be a fortnight.

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(3) The period for which the supply is ordinarily maintained in—

(a) a year of ample rainfall is between October and June;

(b) a year of scanty rainfall between October and February;

(c) a year of drought these canals do not act at all.

13. The extent to which the value of the produce of land is increased by irrigation is similar to that of lands under canals of continuous flow in years of ample rainfall.

15. Irrigation under intermittent canals is generally supplemented by wells where it is possible, and this is essential in years of scanty rainfall.

17. The annual average rate per acre paid on account of irrigation—

(3) by the owner of the land to the Government in the form of enhancement of revenue or water advantage rate is about Rs. 3 per acre of irrigable area.

18. Private expenditure necessary to bring the water to the field or to prepare the land for irrigation is the same as for lands under canals of continuous flow. The expenditure is incurred by the tenant and he has no security for recoupment except prospective increase in the value of crops.

19. Deterioration to the soil has resulted from irrigation without manure. Too profuse, too extensive or too frequent irrigation, water-logging and salt efflorescence are scarcely met with on these canals.

20. The maintenance, repairs, silt clearance and the like are all carried out by the irrigators at almost no cost, as bodily labour is contributed by each irrigator. The system works well and no legislation is required.

21. All such canals are constructed by private persons. No trouble has ever arisen in regard of the supply of water and of the realization of dues for the same. Government has not found it necessary to take over the management of private canals.

22. It is advisable to encourage and assist the construction by private persons of further canals. This can best be done by inducements of low water-rate for a period of years after the construction of such canals. Advances may also be given for initial expenditure.

D.—TANKS.

23. The tanks in the Poona District are supplied with water by (1) flood waters of the nallahs on which they are built. There are some tanks which are fed from the canals of continuous flow in addition to the floods.

(2) The distribution of water to the lands is made in the same way as for lands under canals of continuous flow.

(3) The supply is ordinarily maintained—

(a) In a year of ample rainfall for a whole year.

(b) In a year of scanty rainfall up to end of January if possible.

(c) In a year of drought the supply is altogether doubtful.

(4) The area ordinarily irrigated from a tank varies with the capacity of such tanks.

24. The answer to this paragraph is the same as noted under paragraph 7 above.

26. The answer to this paragraph is the same as for paragraph 15 above.

27. For answer to this paragraph please see paragraph 8 above.

POONA DISTRICT.

(Deccan.)

Question No. 2.—(Culturable and irrigable areas, etc.)

Answer.—Ordinarily there is no demand for water for irrigation during south-west monsoons except perennial crops. The following statement shows the crops under irrigation and other particulars :—

Crops.	Number of waterings.	Time.	REMARKS.
Perennial *	27 to 30	12 months	* Pan gardens (betel-leaf) require water every 5th day.
Eight months †	12 to 15	June to January	† The number of waterings varies according to the quantity and interval of rainfall.
Monsoon dry ‡	1 or 2	June to October	
Monsoon wet §	3 to 4	Ditto.	
Rabi ¶	4 to 6	November to February.	
Hot weather (fodder crops) ††	8 to 8	March to June.	

23. The answer given to paragraph 9 above applies to this paragraph.

29. Vide answer to paragraph 10 above.

30. The maintenance (watching, repairs, silt clearance and the like) is provided for by Government at an annual approximate cost of Rs. 1½ per acre irrigated. The system works fairly well and no legislation is required.

31. There are no tanks in this district constructed by private persons.

32. It is advisable to encourage and assist private persons in the construction of further tanks by employing famine labour on them and by granting special concessions to owners of such tanks.

33. There is not much inconvenience experienced from the liability of tanks to silt up, as the silting always takes place in the deepest parts. No statistics regarding the silt accumulation are available. The silt is not removed by dredging. Steps are taken to prevent ultimate silting up of the tanks by leaving sluices in the lowest parts of the tanks.

E.—WELLS.

34. (1) The average depth of permanent wells is about 40 feet, the water surface being about 30 feet deep and depth of water at the beginning of hot weather 10 feet.

(2) All wells are invariably supplied from springs; in case of wells close to and under canals, the supply is from canal percolation also. These springs are liable to fail in a year of drought: they do not, however, fail in an ordinary year. There are no saline wells in this district.

(3) The average cost of construction of a permanent well of two *mots* capacity (that is, a well which can supply water for two *mots* all the year round) is Rs. 1,500 to 1,600. The average cost of *kacheha* wells is Rs. 250 to 300, the cost always varying with the diameter of the pit and the material used in construction.

(4) The average duration of a well is 75 years.

(5) The water is usually raised by *mots* drawn by two or four bullocks according to the size of the *mots* and the depth from which water has to be lifted.

(6) The average area attached to and commanded by a well of one *mot* is four acres and that of two *mots* from eight to ten acres.

(7) The average area irrigated is two acres in any one year.

38. Serious difficulties are met with in the selection of a spot in which a supply of water will be obtained. No difficulties are met with in actual construction. No assistance has been offered by Government or by local bodies in the shape of expert advice, trial borings or otherwise. It would be useful if it were given, and this can be done by appointing an engineer who can give expert advice by taking levels and borings.

39. The construction by Government of wells in and which is private property is feasible if the wells were constructed on junctions of three or more survey numbers, so that one well could be useful for all. Such an arrangement will reduce the cost of a well to a minimum and the rental charges payable to Government ought to be consequently very slight.

40. Temporary wells (*bhudkis*) are commonly used in this district where possible. They are, however, no protection against drought as they fail with the nallahs. In a year of scanty rainfall temporary *bhudkis* should be encouraged by supplying to the cultivators the necessary appliances at nominal rentals.

II.

The distribution of water if under Government supervision is controlled by the rotation system, by special establishment appointed for the purpose; and irrigation revenue is realized as a separate water-rate in case of tank irrigation which is under Government control and for which capital and revenue accounts are kept; but the irrigation rate is simply an enhanced cess on the lands irrigated from old irrigation works for which only revenue accounts are kept.

Question No. 3.—(Black cotton soil.)

Answer.—When the land irrigated is black soil there is no demand for water in average rainfall seasons, but it is required when there is prolonged drought. In years of good rainfall there is a falling off in irrigated areas and the revenue is more precarious than on tanks where the lands are other than black soil. There has been a great desire on the part of owners of black soil lands to have irrigation tanks, because this district has not good and seasonable rain during one out of five years. There are not continued stretches of black soil and generally an average cultivator possesses all kinds of lands and any one of which requires water for crops grown on it in all seasons of the year. Directly, tanks are not remunerative, but they are desirable in so far as they conduce to the general welfare of the surrounding district.

Mr. N.
Visnu.

18 Dec. 01.

Mr. N.
Vishnu.

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Question No 4.—(Government irrigation works.)

Answer.—The Nira Canal and the Mutha Canal can safely be depended upon in a season of drought.

Question No. 6.—(District or village works.)

Answer.—The protective value of these works can be increased by expending more money on them and by greater attention to their up-keep and by constructing new works. Local responsibilities should be enforced. The value of such works (without reference to irrigation) concerning the water-supply of villages for men and cattle is very great.

Question No. 7.—(Wells.)

Answer.—It is both desirable and possible to stimulate construction of new wells by inducement and advances to land-owners.

Out of 155 wells inspected and for which information has been gathered, 114 have failed to supply even an ordinary supply for drinking purposes. Nine wells were deepened with the result that all of them supplied an increased quantity of water, but not quite sufficient for the usual area under those wells during previous years of good rainfall. Three wells failed altogether. Average depth of water below surface 30 feet; and area irrigated under each averaged two acres. Average cost of each well used for irrigation is Rs. 250.

Question No. 8.—(Drainage works.)

Answer.—Tracts of land under the Nira Canal in the villages of Moorum, Karinja, Wadgaon, Pandhara, Sangwi and under the Mutha Canal in the villages of Manjri, Hadapsar and Moondva have been water-logged by excess of percolation from the canals and the bad nature of the soil; but this area is only about one per cent. of the whole irrigable area. There are no drainage works and none are required.

Question No. 13.—(Irrigation receipts and charges.)

Answer.—Water-rates are fixed from time to time on each tank separately for the various crops grown. Appli-

cations for water are received annually (every season) for crops requiring it. The distribution of water to applicants is controlled by—

- (1) demand and supply available in the tank;
- (2) priority of application for water;
- (3) situation of the lands to be watered; and
- (4) nature and value of the crops requiring water.

The effect on irrigation and irrigation revenue is very marked in years of good rainfall. In years of favourable rainfall, the monsoon and rabi irrigation areas fall off by almost 75 per cent. There is not, however, much falling off of revenue, as perennial crops come to prominence in such years. Arrangements are always made to keep the tanks empty at the beginning of the monsoons of each year. The supply in the tanks cannot be made to last longer than one year as all the calculations for the tanks are based upon 12 months' supply only, the construction of the tanks to hold water over 12 months' supply being a mere waste as replenishment is a certainty from the regular ghat rains.

Question No. 14.—(Value of works in reducing claims for famine relief.)

Answer.—The protective value of irrigation works can not be in this district overrated.

Areas irrigated under these tanks in 1897 were as follows:—

	Acres.
Mutha Canal	12,631
Nira Canal	47,514

No villages protected by these works required any famine relief in 1897 and in subsequent years. Had these works been non-existing the cost of famine relief would have increased in this district by at least 10 lakhs of rupees in any one year of famine.

1. Q. (The President)—You belong to the Public Works Department?—Yes.

2. Q. What appointment do you hold?—I am a supervisor.

3. Q. How long have you been in the department?—Twenty-three and a half years or a little over that.

4. Q. You have always been in the Poona district?—Yes.

5. Q. How long have you been in the Irrigation Division?—From the beginning of my service.

6. Q. You know the Nira Canal and Mutha Canal?—Yes, I know both. I have worked on the former system as well as the latter for years.

7. Q. You say, "The Nira Canal irrigates 45,000 acres?"—Yes, that was the area last year.

8. Q. What is the maximum discharge of your canal?—450 cusecs; there is a proposal to enlarge it to 720 cusecs.

9. Q. Where does the water come from?—From a reservoir.

10. Q. Is it proposed to enlarge the storage also?—Yes; two new sites were selected; what became of the proposal I do not know.

11. Q. Is the water freely taken on the Nira?—Yes.

12. Q. Always?—Yes, but most freely during the wheat season.

13. Q. Do the people apply for water every year?—Yes; every season for *rabi*, *kharif*, and the hot weather crop. The hot weather crop is between 31st March and 15th June.

14. Q. Do you give water then for fodder crops?—Yes. When we have sufficient water we give it; otherwise we refuse it.

15. Q. Do you give water to sugarcane?—Yes, and to some garden crops which are carried over from the *rabi* season. For hot weather crops we charge separately. Sometimes the cultivators take the water without leave; we then charge a higher rate.

16. Q. Do you think it would be wasted if they did not apply it?—The difficulty would be to manage an equal distribution. There is a rush for water sometimes and the people don't obey orders. Even now with the applications, it is difficult to regulate the distribution.

17. Q. How is the water given out of the canal; have you small sluices?—We have outlets. We estimate that a particular outlet can irrigate so many acres and if we find the applications on an outlet more than we can irrigate

we reduce the area for each cultivator proportionately. The Nira Canal is a protective work and we have made arrangements to give water to the cultivators proportionately to their holdings.

18. Q. Whom do the outlets belong to?—All the outlets belong to Government.

19. Q. How are the sites fixed?—According to the land to be irrigated. The whole land between two nallahs can generally be irrigated by an outlet.

20. Q. If you abolished the application system, what would be the result?—The result would be that persons at the head of the outlet will be able to irrigate their lands and persons at the tail will get no water at all. We so arrange that everyone gets water every five days or eight days.

21. Q. You shut the outlets for a certain number of days and keep them open on certain days?—Yes.

22. Q. Does the cultivator at the head take advantage of the open outlets?—No. From these outlets we have smaller outlets for which locking arrangements are made. The outlets are generally kept open for three days. The *Pathkuri* begins at the tail and waters each field in rotation.

23. Q. What is the volume of water delivered?—Our distributaries carry about 60 cusecs; the outlets to the fields deliver about 1 cusecs.

24. Q. Water is given to every applicant in rotation?—Yes, by *Pathkaris* and *Chowkidars*; we pay Rs. 7 to the man who opens the outlets and Rs. 11 or Rs. 12 to the man who measures the areas and sees that canal rules are observed.

25. Q. Is it not difficult to find honest men for this work?—Bribery is always going on. When tangible proofs of dishonesty are produced, we dismiss the men. There is no other way. From experience I believe that the cultivators are more at fault than the canal establishment. Even if the distribution were left to the villagers there would be partialities.

26. Q. Is there any leakage in the canal?—The canal is not water-tight, but we have made many improvements. We lose half the water by leakage in 100 miles.

27. Q. Does the canal run all the year round?—Yes.

28. Q. Is the water in the canal muddy?—No.

29. Q. Is there always a demand? There is never any doubt about the people taking the water?—No; there is always a demand.

30. Q. Have you any black cotton soil under the canal?—No.

31. Q. Have you any experience of black cotton soil?—No.

32. Q. You say "there is a great desire on the part of owners of black-soil lands to have irrigation tanks, because this district has not good and seasonable rain during one out of five years." Do you think that where the rains are so uncertain as in Poona, the people will take water to irrigate black cotton soil?—I am not certain, but I should say they would take water in four out of five years. The soil is not the real black cotton soil. During the last three years the demand has been very great.

33. Q. You spoke about the project for enlarging the canal?—Yes. Our water is not sufficient for all the requirements of irrigation.

34. Q. Do you not irrigate the whole of the irrigable land every year?—No, if the canal is enlarged it will irrigate a much larger area.

35. Q. You propose to irrigate a larger area without any increase in the length of the canal?—Yes.

36. Q. Is your canal connected with any village tank?—No, the Mutha Canal is connected with two tanks.

37. Q. Are these tanks fed by the canal?—Yes, they are fed by the canal and by nallah water.

38. Q. The object is to store the water that goes down?—Yes. One tank is being made on the Nira Canal.

39. Q. Is there room for more?—There is room at the tail of the Nira Canal for three more tanks. A good deal of water goes to waste.

40. Q. Supposing it was desired not to allow any water to go to waste could you make a reservoir to hold all the monsoon supply?—I do not think so; the cost will be prohibitive.

41. Q. But the result would be a great increase of irrigation?—Yes.

42. Q. The Nira is worked with the object of being a protection against famine?—Yes.

43. Q. It is the largest canal in the Presidency?—Yes, excepting Sindh.

44. Q. It irrigates 47,000 acres?—In some years it irrigates about 60,000 acres.

45. Q. What is the culturable area commanded?—About 280,000 acres.

46. Q. It irrigates about $\frac{1}{2}$?—Yes.

47. Q. To irrigate a larger area you would want to lengthen your channels?—No. They would require widening.

48. Q. (*Mr. Higham*)—Is the land left fallow at times?—No, the practice in these parts is to go on manuring and growing crops every year.

49. Q. (*The President*)—Supposing the irrigated area is increased, could the people get sufficient manure for it?—That would be a difficulty; but there is an inexhaustible supply of fish manure which is now coming into vogue.

50. Q. Would they use it for wheat and jari?—At present they use it only for sugarcane, but in time they will use it for everything.

51. Q. You say, "in a year of ample rainfall the value of the produce of land is not increased by irrigation to any appreciable extent." Do you find people taking to irrigation in such years?—No, not when there is a good rainfall and when they are sure that the rain will be quite sufficient.

52. Q. Supposing they get a good rainfall up to the 15th October and then there is no more, what do they do?—Then they rush for water.

53. Q. You don't generally have rain in the cold weather?—Sometimes. I know of a good rainfall throughout the whole *rabi* season in December and January.

54. Q. That is very exceptional?—It happens once in four years or five years.

55. Q. Then the people do not take canal water?—No.

56. Q. What do they pay for irrigating *rabi*?—Rs. 2 per acre on the Mutha Canal.

57. Q. Would they take more if they had to pay less?—No, they would not. They don't mind paying the full rate for only one watering when they want water.

58. Q. Would they pay a rupee more?—I think they would.

59. Q. For *rabi*?—Yes, they take water without permission so as to get it quickly and pay double rates willingly.

60. Q. Would that be in a year of drought?—No, any year. They take water without permission and we fine them charging double rates.

61. Q. Does the distribution require a very considerable establishment?—No. A *Patkari* looks after about 200 acres.

62. Q.—You have 250 *Patkaris*?—No, we do not increase the establishment when the area extends. We keep a permanent establishment according to the area under perennial crops. During the *rabi* season—four months—we generally put on Assistant *Patkaris* to guard the outlets.

63. Q. Are not these men open to bribery?—At times there is a great rush for water and it may happen that they are bribed then.

64. Q. Do you think you could abolish the application system altogether?—No; it would not do. If we give up the system there would be great complications and difficulty in assessing the rates.

65. Q. Why, you can measure the areas irrigated?—It cannot be done. During the *kharif* season they plough directly the crops are cut and unless we have applications our establishment cannot find out what particular holdings have been watered.

66. Q. If a man does not apply and takes water he is detected now?—Yes, he is detected because it is not a matter of a week or four days; it is a matter of four months.

67. Q. Do you prepare any list of persons who apply?—Our establishments have to make a list of all persons who are permitted to take water.

68. Q. You say a man who takes water without application can be detected during these four months?—Yes.

69. Q. Many are detected?—Yes. The difficulty will be for our establishment to go to each field. Then the man who takes water this year may not take it next year; so every time we would have to make fresh lists of persons taking water.

70. Q. How do you assess the lands?—Applications are received through the village authorities; we make sure that the man is the *bona fide* owner of the land; then our Inspector goes to see that the land is properly prepared for irrigation. A pass is then granted, a copy of which is registered in the Sub-Divisional office. The *Patkari* on his round of inspection examines these passes. After one or two waterings are done measurements are taken. The measuring officer takes with him the register of the passes and has a map with him from which he finds out the number; if he finds that there is any holding which is not registered, he measures it and reports that such and such a holding has been watered but not detected by the Inspector or the *Patkari*. An explanation is asked for and if it is not satisfactory the Inspector or the *Patkari* is fined or dismissed.

71. Q. You say "arrangements are always made to keep the tanks empty at the beginning of the monsoons of each year." What do you mean by that?—In the case of the Bhatgarh reservoir we open out our gates at the beginning of the monsoon and let all the water out. We get a telegram from Bombay that the monsoon has burst before we open the gates.

72. Q. What is the advantage?—We do that so as to prevent a deposit of silt brought down by the first flood.

73. Q. You never try to keep your water for two seasons?—These reservoirs are not made to last for two seasons. In the case of the Mutha Canal, it is very difficult to keep the water for even one season.

74. Q. (*Mr. Higham*)—When people on the watercourse send in applications for the area they want to irrigate, I understand that you are bound to give a certain quantity of water from each outlet on the days the outlet is open?—Yes.

75. Q. The canal is divided into sections?—Yes.

76. Q. The water issued to each section depends upon the area for which the pass is given?—Yes.

77. Q. When water goes through the outlet does the establishment have anything to do with regulating the distribution within the watercourse?—Yes. They begin to open the field outlets at the end of the distributaries.

78. Q. They begin at the end?—Yes. The end people get the first day's water, and on the last day the people at the head get water and then the outlet is closed.

79. Q. Have you seen the circulars which were lately brought into operation?—Yes. All these orders have been carried out.

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80. Q. You have a Check Inspector?—Yes, that is a late institution. A Check Inspector sees that a proper quantity of water is given; and that no outlet is open out of its turn.

81. Q. He has nothing to do with the distribution or control of the field outlets?—Nothing.

82. Q. His control is limited to the canal openings?—Yes.

83. Q. Your *Patkaris* alone control the distribution inside the watercourse?—Yes.

84. Q. The Inspector does not control that?—No. An Inspector has general control over two or three *Patkaris*. He has only to see whether the area which has to be watered is watered or not during a particular period, and if anybody has remained without water for some reason or other then to allow him certain days and make up his quantity.

85. Q. What is the length of your watercourse?—The smallest is only 80 to 90 feet. They run up to about a mile in length.

86. Q. How long are the distributaries?—Some are 18 miles long; but there are small distributaries where pipes are 4 to 6 inches and the discharge is 3 cubic feet per second. All the distributaries are built by Government.

87. Q. At the end of the Government distributaries, you have a distributing basin?—Yes, on both sides. We find it very difficult sometimes to carry water by the distributary, when there is deficient water in the canal. We have then to make fresh arrangements to give water at the head on particular days and to give water at the end out of rotation.

88. Q. What is the plan of the watercourse?—For every one hundred acres, we allow a 12-inch square outlet.

89. Q. It makes no difference whether they want it for rice or *bajri*?—It does. This will suffice for 100 acres of *juari*; we take *juari* as our basis.

90. Q. Do you put a lock to the field outlet?—Yes, otherwise the cultivators open it.

91. Q. Who locks the outlet?—The *Patkari*.

92. Q. Do the cultivators ever break them?—Yes, sometimes. We then fine all the cultivators on that outlet if they do not find out the man who has opened it. If we have reason to believe that all the cultivators have combined and opened the lock for the purpose of irrigation we fine all.

93. Q. You get them fined by the Magistrate?—No, we only tell them that so much damage is done and that they have to pay so much.

94. Q. And do you recover in that way?—Yes.

95. Q. Do you ever prosecute them for damage?—Yes, when a man is caught in the act; but the difficulties of prosecuting are very great.

96. Q. Whom do you prosecute them before?—Before the *Mamlatdar*; but it is very troublesome. Our establishment has to go before the *Mamlatdar* to prosecute and then there is nobody to look after our distributaries. We avoid prosecutions as much as possible and punish them departmentally.

97. Q. You have outlets 12-inch square for every 100 acres?—Yes.

98. Q. That is a great number. What is the irrigable area on a watercourse?—It goes up about 5,000 to 6,000 acres on the biggest watercourse of which the command is 30,000.

99. Q. When do you measure the crop?—*Kharif* crops are measured after the first waterings are over, i.e., from the middle of August to October or November.

100. Q. During the currency of the crop?—Yes.

101. Q. Do you have final measurements?—No. Ten per cent. of the crops are measured by the Sub-Divisional officer or any of his sub-officers.

102. Q. Suppose any area measured after the first waterings fails to mature how is that remitted?—The cultivator has to apply; we do not give any remission without application.

103. Q. What is your final area compared with your register?—We find that the area measured is always about 25 per cent. more than what was applied for.

104. Q. Do you take any notice of that?—Yes; we assess the actual area measured and not the area applied for.

105. Q. Who measures?—We have got regular measuring karkuns.

106. Q. Are they under the Collector?—No, they are under the Irrigation Department.

107. Q. But the Irrigation Department people have to obey the Orders of the Collector?—Yes. But the Collector has nothing to do with the assessment.

108. Q. Is there any appeal from the orders of the Collector on canal questions?—Yes.

109. Q. Allowed by rules?—Yes, by the Canal Act.

110. Q. Do they make many appeals?—Very few.

111. Q. You say that during the famine of 1897 no relief was given to any of the villagers who irrigated from the *Nira* and the *Mutha* Canals?—Yes.

112. Q. Did any people from the *Mutha* Canal villages go on relief works?—As far as my inquiries go nobody went; they had sufficient work in their own villages.

113. Q. They had good crops?—Yes.

114. Q. Did they employ labour from other villages?—In very small proportions.

115. Q. You say 10 lakhs were spent on famine reliefs is that a rough estimate?—Yes.

116. Q. In 1876-77 Government spent on the *Nira* villages 11 lakhs of rupees?—Yes. I was there; I know the figure.

117. Q. In last famine Government had to spend nothing?—Nothing. In 1876 the *Mutha* Canal was finished up to the 25th mile and beyond that they had famine labour.

118. Q. Do you recommend the construction of tail reservoirs?—Yes.

119. Q. Do you recommend them for the irrigation of black-soil or any soil?—Anywhere; the black-soil here is not the black cotton soil of the *Berars*; it is a black soil which requires water.

120. Q. It only requires water in the case of drought?—Yes; in other seasons the soil grows good crops without watering.

121. Q. Do they grow wheat without water?—Yes, in seasons of very good rain.

122. Q. If they use water in a year of good rain does it do any harm?—They don't care if they get a 12-anna crop; some crops get damaged by the canal water.

123. Q. Wheat crop get damaged by excessive watering?—Yes.

124. Q. It blights and rusts?—Not by canal but by rain water.

125. Q. (*The President*)—In paragraph 11 of page 2 you say, "damage is done to the soil from irrigation without manure and also from water-logging or salt efflorescence." Is there any salt efflorescence on the *Nira* Canal?—Between 13th and 25th mile there are one or two square miles on the right bank of the canal where there is efflorescence.

126. Q. Has anything been done to remedy it?—Nothing.

127. Q. You have got no experience of drainage?—No, that was suggested at one time by the Inspector General for Irrigation, Mr. Forbes.

128. Q. Would you recommend drainage?—No, I don't think drainage can do anything for salt efflorescence.

129. Q. Is it getting worse?—I have no experience.

130. Q. You don't think it is likely that if land is well drained it would wash away the salt?—I have no experience.

131. Q. Have you ever known a year in which all the water was not used on these canals?—On the *Nira* Canal yes.

132. Q. When was the last time?—I remember two years when we had to let out 50 feet of water.

133. Q. 1895 was one year; what was the other?—1890 or 1891.

134. Q. How long has the canal been working?—Since 1884. Every year we lose a little water, but these years were abnormal; we had to send down water.

135. Q. Because the rain was excessive?—Yes, and there was no demand for *rabi* water.

136. Q. You say every year you lose a little?—Yes.

137. Q. Nothing very considerable?—No, very little.

138. Q. (*Mr. Ibbetson*)—You say the canal has been working from 1884?—Yes.

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139. Q. In 15 years you have had two years in which you did not make use of all the water?—Yes, before that the canal was not in working order; every year water is let down for the facility of raising the dam.

140. Q. (Mr. Muir-Mackenzie)—How is it that the irrigated area is much larger in famine years than in the years of ordinary rainfall?—Because the people don't take water in the *rabi* season.

141. Q. If people don't take water how is it that you have not an excess?—We increase the area of sugarcane.

142. Q. (Mr. Ibbetson).—If you have a short supply of water you give less to sugarcane?—No; if water is short we cut off the area at the tail.

143. Q. Supposing another man wants water beyond?—We don't give it. We say, "grow your sugarcane under wells."

144. Q. You do cut down the applications?—Yes, that is only on the Nira, which is a protective work. On the Mutha, which is a productive work, all the demands are met.

145. Q. Do you give water first for irrigating sugarcane on the Mutha?—Yes.

146. Q. You look upon that as a commercial concern?—Yes.

147. Q. Why do you make that difference between the two canals?—The Nira Canal is a protective work.

148. Q. And the Mutha Canal?—It is a productive work.

149. Q. You don't know the origin of the difference?—No.

150. Q. What kind of village works have you. Have you *bandhāras*?—No, we have small tanks.

151. Q. Have you any experience of tanks?—Yes, of two tanks.

152. Q. Are there not many tanks in Poona?—There are four tanks in working order.

153. Q. Not several hundreds?—Not more than half a dozen or at the most nine.

154. Q. You say, "local responsibilities should be enforced." What do you mean by that?—People should be made to clear the silt.

155. Q. I thought Government was responsible for clearing the silt?—No, in small tanks it does not pay; Government would be paying more than the return.

156. Q. Where it is not worth Government's while to clear, what do you do. Do you make people do it?—Yes, and if they don't do it, we give them a fortnight's notice that the water will be stopped.

157. Q. Do you stop the water?—Yes.

158. Q. And they are afraid of that?—Yes.

159. Q. In the case of village tanks supposing these people don't clear them, how do you manage?—When there is water in the tank, they clear it voluntarily.

160. Q. Do you think legislation would be useful to enforce them to do it?—Yes.

161. Q. If tanks are so useful and valuable, why have you not got a number of them, as in Gujarat?—The want of funds is the principal obstacle.

162. Q. The people are poorer here?—I have not seen the Gujarat tanks; here a small tank would not cost less than Rs. 20,000.

163. Q. What do you mean by small tanks. How many acres would they irrigate?—About 100 acres would be the minimum.

164. Q. Rs. 200 per acre?—Yes.

165. Q. That would be pretty costly?—Yes.

166. Q. It would not pay Government to make them?—No.

167. Q. You say, "out of 155 wells inspected and for which information has been gathered, 114 have failed to supply even an ordinary supply for drinking purposes?"—All these are above the canal.

168. Q. They began to fail in the first famine year?—They did not fail in the first year; in the second year there was good rain; last year they failed.

169. Q. This year have they failed?—No, not yet; there was better rain; there was no water in the nullahs last year.

170. Q. How about 1896-97?—I was not on the Nira then.

171. Q. Will you tell me what wells you refer to?—The wells higher up than the canal; all the wells below the canal did very well.

172. Q. Do you think the wells above the canal were a fair type of wells throughout this district?—Yes, in the eastern part. I have seen peculiar things in connection with these wells; I have seen people digging a chain of five or six wells ranging from high ground into ravines. On the top they got good water but not below.

173. Q. You say five or six wells in what area?—In not more than 50 acres. I know another case in which five wells were sunk in 30 acres and proved too much.

174. Q. (Mr. Higham).—The falling of the wells occurs at the same time as the general falling of the spring level throughout the whole country owing to drought?—No; it was irrespective of that.

175. Q. (Mr. Ibbetson).—You say in your second memo., paragraph 10, that "Rs. 16 per acre are required for preparing the land for irrigation"?—That is sugarcane irrigation.

176. Q. You say, "it is advisable to encourage and assist the construction by private persons of further canals." What further canals do you refer to?—Small canals from streams.

177. Q. What would you do to get people to do this? How could you help them?—The best way to help them would be to get *bandhāras* built by Government.

178. Q. Would that pay Government?—I think so.

179. Q. You say you would charge no water-rate?—Yes; to induce them to take it up.

180. Q. Do you think they will do it on these terms?—Yes.

181. Q. Supposing you say you may have the water for nothing?—They will do it then. In 1896-97 on the Mutha they turned every drop by means of bunds.

182. Q. That was a famine year?—Yes.

183. Q. If the people had three or four good years do you think they would make bunds?—Yes, because they would get water for high class crops, which would be more paying than the high rate crops on the canal.

184. Q. The canal charges two rupees an acre?—Yes, for *rabi* crops; the charge for sugarcane is the same on both works.

185. Q. If a man makes a bund?—No; on the channels all the water is picked up and charged full water-rates.

186. Q. You say that the construction by Government of wells in land which is private property is feasible if the wells are constructed on junctions of three or more survey numbers." Do you think the people would care to have Government going into their lands and making wells?—Yes.

187. Q. They would have to pay wet revenue?—They would not grudge paying wet revenue; the difficulty will be of a regular supply; if the water is not sufficient, Government will be the losers in many cases.

188. Q. Do you think that the holdings are so small that the people cannot afford to make wells?—No; there are many cultivators who have got big holdings; but they do not know whether they can get water or not. If expert opinion could be obtained as to sites they would spend their own money on making wells.

189. Q. Do you think boring tools would be useful?—Yes, in these parts, but not on the rocky portions.

190. Q. Why not?—Because they are not fit for boring rocks.

191. Q. (Mr. Rajratna Mdlr.) You say if a rayat irrigates his land without obtaining formal sanction he is liable to a double charge?—Yes.

192. Q. Even though his application is not dealt with for a month or two?—It does not take so long to deal with his application.

193. Q. It may be at least two or three weeks?—Inspectors have orders to send in their reports within three days after the receipt of the applications. Generally the cultivators' applications are not correctly written. There is some flaw in them. As soon as an application is received we have to see whether the bund is properly made and the channel is cleared of silt and weeds. Ten or eleven days is the maximum delay.

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194. Q. Does the rayat as a rule change his crops from year to year?—No. Only sugarcane plots are changed every three years.

195. Q. For others crops?—No; it is too expensive.

196. Q. Could not some plan be adopted for dispensing with applications in regard to other crops?—It is difficult to find probable plots.

197. Q. You have a system of penalty?—Yes.

198. Q. You give them water out of turn in some cases?—Yes; the Sub-Divisional Officer does it.

199. Q. Has sanction to be obtained in such cases?—As soon as watering on a particular channel is done the Patkari reports that so many numbers are left without water; and the Sub-Divisional Officer issues orders that water must be given on Sunday, which is set aside for that purpose.

200. Q. Do you think the people would be able to regulate their supplies by turns if you allowed a certain quantity of water to each distributary and left it to the rayats to distribute according to their turns?—I think it could be done.

201. Q. There would be no difficulty you think?—No; but it would take a long time to work smoothly as the cultivators would at first fight among themselves and those at the head would be more benefited than those at the end.

202. Q. But you would not supply them before their turn? You would not open the sluices?—Once the sluices are opened the distributary is at their disposal and the men at the head could use up more water than those lower down. Even now somehow or other a man at the head gets most water.

203. Q. Are there many prosecutions on the Nira Canal?—Not very many.

204. Q. How many *per annum*?—Not more than five; we don't go in for prosecutions; our establishments are put to much inconvenience; and there is nobody to look after their work.

205. Q. Do you fix the area to be irrigated?—Yes, in a year of drought. In other years the man who applies first gets water first.

206. Q. Even though he may be a new applicant?—Yes; new applicant or old applicant.

207. Q. They get their usual quota?—Yes, extra water will be given to *juari* crop.

208. Q. Is your water-rate fixed on the number of floodings or the crop?—On the crop.

209. Q. What is the rate for *juari*?—Rs. 2 per acre. It is based on the quantity of water and the season in which it is wanted.

210. Q. He may take any number of waterings?—Yes, *juari* generally requires four waterings; in the hot weather it requires six waterings and we charge Rs. 8. In the monsoon when we have plenty of water we charge Re. 1 only.

211. Q. The area watered has nothing to do with the rate?—No.

212. Q. You charge Rs. 8 even though you give one flooding; one watering?—They always require six waterings or more and not less—during the period of 31st March to 15th June.

213. Q. In paragraph 32 of your second note you say, "it is advisable to encourage and assist private persons in the construction of further tanks—by granting special concessions to owners of such tanks." Would you reduce the rate of assessment in order to encourage the people to construct tanks?—No; simply the reduction of assessment will not do; complete remission of the whole water-rate for some fixed period should be granted.

214. Q. In addition to a low rate of interest?—Yes; that would help the cultivator still more.

215. Q. Do you think many would come forward on those terms?—As far as I know in this part of the country I do not think there is any private enterprise, and I fear the people will not come forward.

216. Q. (Mr. Muir-Mackenzie)—Have you noticed whether in your district the number of wells outside the canal areas has largely increased during the famine?—Yes.

217. Q. Have the people generally been successful in finding water?—Yes, in all the wells water has been tapped, but not sufficient for crops to grow in the years of drought.

218. Q. But sufficient to grow then in ordinary years?—Yes.

219. Q. Do you think that wells would be useful?—Yes, in ordinary years; in years of drought they would not be of any use.

220. Q. Do you think that the wells made in these famine years will always be of use to the people?—Yes.

221. Q. You don't think people are too lazy to work them?—No; they are keen about irrigation, but the difficulty is that often they do not tap water.

222. Q. Were the greater number of these wells dug from takavi or from private resources?—I could not say, they have built some wells with takavi; how many I could not say.

223. Q. What is the cost of a well?—That differs in different localities. In Kara valley there are wells which cost Rs. 3,000 or Rs. 3,500. Between the Kara and the Mutha the water is about 35 to 40 feet deep; there is a rock for about 10 or 12 feet, the soil above is black.

224. Q. Do you think it is worth building them?—How much do they irrigate?—If there are fruit trees they will irrigate about 6 acres of fruit trees in addition to 8 acres of ordinary crops.

225. Q. Are these irrigated crops very much superior to the ordinary monsoon crops?—Yes, generally.

226. Q. They don't grow grain crops?—Very little unless they are hard pressed. They grow fodder for cattle, and a grain called *Hondi* for their own food.

227. Q. Well-to-do cultivators build their own wells?—Yes; they sometimes have to borrow money from the sowcars for these wells.

228. Q. What interest do they have to pay to the sowcars?—Not more than Re. 1 per month per hundred.

229. Q. What does a common well cost?—In the eastern part of the district about Rs. 50 or Rs. 60, because in these parts there is *muram* soil; simple digging is required. A small well can be made for Rs. 50.

230. Q. Does it carry one *mot*?—Yes; the average would be about Rs. 150 for a one-*mot* well; a two-*mot* well will cost about Rs. 250 to Rs. 300.

231. Q. How many acres will one of these wells irrigate?—A well with one *mot* will irrigate two acres of sugarcane and six acres of other crops, that is in particular villages, generally about $1\frac{1}{2}$ to 2 acres of sugarcane and 2 or 3 acres of other crops. Irrigation by wells requires 4 bullocks.

232. Q. Is there a considerable amount of manure used under these wells?—Yes; cow-dung or refuse of the house, they don't use expensive manure except for sugarcane, which is often dressed with fish manure.

233. Q. Do they use oil cakes?—Yes.

234. Q. Of what oil?—Castor oil, safflower, karanj and even karadi brought from Dharwar

235. Q. That is recent?—Yes.

236. Q. Can you think of anything that Government can do which is likely to encourage the people to build wells more than they are already disposed to?—They should be given advances without much interest as well as without much pressure for repayment. Simply digging a well does not improve the land; it requires at least 4 or 5 years to bring the land into regular irrigating order; four or five years at least must be allowed the cultivator without interest and after that it must be taken by instalments.

237. Q. The interest is not very high—5 per cent.?—For a cultivator it is high; the instalments too must be made very small.

238. Q. Do you mean that the instalments should be spread over a large number of years?—Yes; that would be preferable.

239. Q. How many years?—Certainly not less than 15.

240. Q. Supposing Government were not to ask for repayment of the principal at all but instead of that took full garden assessment?—That would induce them to dig wells.

241. Q. How much can Government safely take on a well that costs Rs. 200.—About Rs. 3 per acre; I think the actual irrigated area only should be charged.

242. Q. (Mr. Ibbetson)—Every year?—The average of two or three years might be taken.

243. Q. (Mr. Muir-Mackenzie)—A well that costs Rs. 200 would irrigate two and a half acres of sugarcane and four acres of other crops?—Yes.

244. Q. If Government took no more than Rs. 12, would that be sufficient?—I do not think it would irrigate

four acres of other crops; it would irrigate two acres of sugarcane and two acres of other crops, double-cropped; Government should only charge for the area that is actually irrigated.

245. Q. If Government charged on the area irrigated would that be too much?—No; care should be taken that if the well fails and there is no crop grown no assessment is charged.

246. Q. Were many wells cleared and put in order during the famine?—Not many; there is nothing to put in order in these parts because there is very little silt; the repairs are very small.

247. Q. Is there any desire to construct wells on the part of the cultivators in other parts of the Deccan?—In the Poona district the cultivators are keen about wells; I do not know about other districts.

248. Q. You say Rs. 16 an acre is the cost of preparing land for irrigation?—Yes.

249. Q. What would it cost a man to take two or three waterings for monsoon crops?—Rs. 1.

250. Q. He does it himself?—Yes; he does not employ labour; he works the channel by plough and it costs nothing.

251. Q. What measures would you recommend to prevent damage being done to wells by irrigation and to stop profusion of waterings?—It would require a bigger establishment. Our inspecting staff is insufficient for the purpose.

252. Q. (Mr. Ibbetson)—Do you know the whole of the Poona district fairly well?—Yes, the whole of the eastern part, right up from Khed.

253. Q. I suppose the only place where a well could be profitably made is where the soil is fit for well irrigation. You could not make wells everywhere and make them pay?—No.

254. Q. In what proportion of the whole tract do you suppose a well could be made profitable, supposing, you had plenty of money?—Not in more than $\frac{1}{8}$; my calculation is very rough; but it is not more than $\frac{1}{8}$ certainly.

255. Q. Why do you put it so low?—Because the tracts are very high and the rivers are very low.

256. Q. (Mr. Muir-Mackenzie)—Do you consider the present system of assessment is as satisfactory as it could be?—I have not considered that question.

257. Q. Do you think the rates on the Nira might be raised?—On the Mutha they are just right; if they are raised I do not think irrigation will increase. On the Nira there is some scope for raising the water-rate a little.

258. Q. On the *rabi* and monsoon crop?—Yes.

259. Q. Do you prefer to have crop-rate to consolidated rate?—I prefer a crop-rate.

260. Q. Why?—If all crops got water at the same rate, it would be very difficult to work the canal.

Mr. N.
Vishnu.

18 Dec. 01.

TWENTY-THIRD DAY.

Poona, 19th December 1901.

WITNESS No. 52.—MR. B. A. BRENDON, I.C.S., Acting Collector, Ahmednagar.

Memorandum by witness.

GENERAL.

The gross area of the district is 6,589 square miles or 4,216,245 acres, of which 3,166,251 acres are cultivable. About $1\frac{1}{2}$ million acres are cultivated in the kharif season and $1\frac{1}{2}$ million acres in the *rabi*. The population is 887,744 with a density of 127 to the square mile.

Soil.—About one-third is black soil of varying quality and the remainder ranges from red to light sandy. The area protected by Government irrigation works is 6,000 acres; by village works 7,000 acres (average of last six years); and by wells 90,000 acres (average of last six years). The average monthly rainfall in the district for the ten years (1886 to 1895) was:—

	Inches.	cents.
January	0	16
February	0	17
March	0	20
April	0	14
May	1	7
June	4	56
July	3	59
August	2	97
September	6	82
October	3	77
November	1	10
December	0	64

the annual average being 25.19 inches. The rainfall since 1895 was as follows:—

	Inches.
1896	20.49
1897	22.61
1898	18.33
1899	13.2
1900	15.82
1901	17.22 (up to 17th November).

Ordinarily there is no demand for water during the monsoon (if favourable). The principal crops which require irrigation are:—

Sugarcane	40 waterings from April to February.
Wheat	8 " " November to March.
Ground nuts	15 " " June to February.
Juari	6 " " October to February.
Gram	5 " " October to January.

The average area under each of the principal *rabi* crops in thousands of acres is:—

Juari	941	Wheat	232
Oil-seeds	178	Gram	113
Vegetables	10	Sugarcane	2

Mr. B. A.
Brendon.

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Irrigation from Government works is controlled by the Public Works Department and the revenue is realized in the shape of a special rate collected in two instalments by the Revenue Department but separately from the land revenue. There appears to be no obstacle to the extension of irrigation arising from sparsity of population, insufficiency of cattle or manure, unsuitability of soil or fear of enhanced assessment. The necessary capital for the cultivation of more expensive crops would be forthcoming if the water were made available. The uncertainty of the supply is a defect which applies only to wells and village works. Large irrigation works could be made with a reasonably secure supply. The law lays down that at a Revision Settlement the increase in the value of land or in the profit of cultivating it due to improvements effected during the former settlement by the holder shall not be taken into consideration in fixing the revised assessment. As far as I am aware, this principle is followed in practice. I do not think the fear of enhanced assessment enters into the farmer's calculations in deciding whether he shall build a well or not. Generally speaking, there are no tenants with leases in this district. The land-holder cultivates his own holding. Loans under the Land Improvement Loans Act are freely offered and taken. More could, I think, be done if the preliminary enquiries and the distribution of the money were entrusted to a properly organized establishment with nothing except *takavi* work to do. The rate of interest is low enough and I do not recommend a reduction. The lowest rate at which land-holders with the best security can borrow in the market is 12 per cent., and the usual rate is 24 per cent. A remission of the interest was granted during the recent famines, but I do not recommend this in ordinary years. I would recommend a partial remission (not a total remission) of the advance in the case of failure to obtain water. No extension of the period of repayment is necessary. The rules already allow a period of 20 years, though in practice the term is frequently not made as long as it might and ought to be. A grant-in-aid might usefully be given to a man who has already dug a well by means of a *takavi* loan and requires more money to complete the masonry. No irrigation works have been constructed during the recent famines by the Revenue Department. The

Mr. B. A. protective value of the completed irrigation works in this district was very small. The effect upon the numbers in receipt of gratuitous relief or of employment on work must have been infinitesimal. Gratuitous relief was found necessary in all villages; and it happened that relief works were opened in close proximity to the villages protected by these irrigation works. This, however, was fortuitous.

VILLAGE WORKS.

There is a considerable number of temporary dams (*bandhāras*) thrown across streams in various parts of the district, but chiefly in Akola and Parner. These have all been constructed by the villagers who dig their own channels and control the distribution of the water. There is only one instance of Government assisting such works. The aggregate extent of cultivation dependent on such works is about 7,000 acres. The figures for the last six years are:—

1895-1896	.	.	.	16,923 acres.
1896-1897	.	.	.	10,649 "
1897-1898	.	.	.	6,921 "
1898-1899	.	.	.	4,884 "
1899-1900	.	.	.	880 "
1900-1901	.	.	.	546 "

showing the extent to which streams have failed in the recent droughts. Land found at the settlement to be irrigable from these channels was classed as "patasthal" and assessed with regard to both soil and water. The water and soil rates are consolidated, and it has not been the practice to grant remissions of the water-rate when the water fails. In my opinion the rates should be separated and the Collector given power to remit the water-rate when water fails. The only new work of this class constructed of late years is a *bandhāra* constructed by a missionary near Vambori. The work has only just been completed and has not yet been utilized. The funds of the District Local Board are not sufficient to enable it to construct works of this character. Government has not assisted the construction of such works either by the District Local Board or by land-holders, though no doubt the takavi rules admit of loans being made to land-holders for the purpose. The supply of water in these channels is maintained in a year of ample rainfall until January; in a year of scanty rainfall until November; and in a year of drought the supply fails altogether. Irrigation from private channels is often supplemented by well-irrigation. The people have a theory that canal water is too cold for the land and that well water is warm and counteracts the bad effects of canal water. In this way fields are sometimes overwatered. The approximate average annual rate charged by Government for the use of water taken through these private channels is

*Note. It varies from Rs. 8-0 in Akola to Rs. 11-0 in Jamkhed. The rate is paid on the area found irrigable at

the time of the settlement. The landholder incurs no expense in bringing water to his fields through these channels. He supplies the necessary labour himself. I think that probably all the streams with sufficient flow are already provided with *bandhāras*. I doubt if there is room for many new *bandhāras*. Many of the old dams, however, require repairing, and Government might usefully undertake the repairs which the villagers of the present day appear to be too divided or too lazy to undertake. But, as these works depend entirely upon an uncertain rainfall, their utility is limited. The only scope for further and useful enterprise in this direction lies in making larger embankments across nallahs which carry off flood waters.

TANKS.

The only tank in this district is the Bhatodi tank, which is under the control of the Public Works Department.

WELLS.

The area irrigated from wells in the last six years is as follows:—

1895-1896	.	.	.	65,795 acres.
1896-1897	.	.	.	126,581 "
1897-1898	.	.	.	96,809 "
1898-1899	.	.	.	100,939 "
1899-1900	.	.	.	101,289 "
1900-1901	.	.	.	59,703 "

Before the present series of droughts began the area irrigated was 65,000 acres. In the first year of famine the area rose to 126,000 acres. The effect of the continued

drought of the last two years is seen in the reduction of the area to 59,000 acres, i.e., less than half of the area irrigated in the first year of drought. The number of new wells constructed annually during the last ten years is not at present ascertainable. The information will, I hope, be available at the end of this month. The last return was for the five years ending 1896-1897. During that period 4,870 new wells were constructed, giving an average of 974 new wells per annum. But judging from the very large takavi grants made since 1896-1897, the number of new wells constructed in the last five years must be much larger. The amounts of takavi loans made during the last ten years for well-construction and repairs are:—

	R
1891-1892	15,550
1892-1893	15,225
1893-1894	6,475
1894-1895	19,020
1895-1896	24,560
1896-1897	4,78,301
1897-1898	2,03,650
1898-1899	97,690
1899-1900	2,77,858
1900-1901	1,24,629

I do not think the fear of enhanced assessment is any impediment to well-construction. Government advances are freely taken. There is probably scope for more being done in this direction, but any great increase in the number of new wells must await the replenishing of the sub-soil water-supply. One of the chief obstacles to the freer use of takavi loans for wells is the indebtedness of so many landholders who, if they have mortgaged their holdings to the full value, have no security to offer. Another is the want of a properly organized establishment for the distribution of the money. During the famines a special establishment has been employed, but in ordinary years the work falls on the Mamlatdars who have little time to devote to this duty. During the famine of 1900-1901, 23 dry wells were bored by means of jumping bars, all but three with success, and more than 300 wells were deepened by ordinary means, water being found in about 80 per cent. of the cases. The record is probably incomplete. But the attempts were made more with a view to obtaining water for drinking purposes than for irrigation, and I have no doubt that many of the wells ran dry again. There was one case in which the jumping bar struck a spring of water which spouted up and filled the well; but this was an isolated instance. The depth of permanent wells varies from 25 to 50 feet, and the average may be taken as 35 feet. The supply is chiefly from percolation and is not liable to fall in an ordinary year or become too saline for use. The cost of construction varies from Rs. 250 to Rs. 400; the average may be taken as Rs. 400. A well once properly constructed will last for a century. The water is invariably drawn by a leather bucket (*mot*) raised by one or two pairs of bullocks. The average area attached to and commanded by a well is about eight acres, of which the area irrigated in any one year is about three acres. The assessment on land irrigated from wells is not much higher than the dry crop rate. It ranges from Rs. 2-7-0 in Akola to Rs. 5-0 per acre in Karjat. The average rate for the district is Rs. 1-2-0. No serious difficulties are encountered in the selection of a spot for a well. The people generally succeed in finding water. There are of course some failures. No difficulties are encountered in the actual construction of the well. Expert advice has not been provided, nor is it advisable that it should be provided. Government has supplied a boring machine, with which up to date very little has been done. The machine requires careful handling and constant sharpening. I hope more will be done with it next year, but it is really required for the purpose of providing drinking water. Long jumping bars are of more general use, and they should have a diameter of not less than three inches, in order that if it is necessary to go still deeper the drill may be worked in the hole made by the bar. Government have already offered to dig trial shafts at its own cost on condition that if water is found the landholder repays the cost of the shaft and completes the well. Very little advantage was taken of this offer. Only about a dozen wells were dug on these terms. One of the reasons for the idea not taking more hold is that the cost of the shaft is such a small part (about Rs. 5) of the total cost that the people do not trouble about it. Another is the want of enterprise on the part of the people. I am not in favour of the construction by Government of wells in private lands. It would cost Government more than it would the landholder, who, having to repay the cost, would suffer. Temporary wells dug in the beds of nallahs are used to a large extent but only for drinking purposes.

1. Q. (*The President*.) You are Acting Collector of Ahmednagar?—Yes.

2. Q. How long have you been there?—I have acted for seven months.

3. Q. Where were you before?—Mostly in Sindh.

4. Q. Have you had any personal experience of the famine?—Chiefly from head-quarters.

5. Q. In your district water is taken for wheat and *juari* steadily when the people can get it. Would a man who started a *juari* crop upon the water of a *bandhara* or by heavy rain in October, pretty readily take it if he could get it?—It would depend on the soil; if it was black soil, he would not want it; for light soil he would take it if he could only get it from wells.

6. Q. Or from *bandharas*?—They are only useful for *khari* crops; in a year of good rain they hold out till January.

7. Q. You say in your memorandum, "There appears to be no obstacle to the extension of irrigation arising from sparsity of population, insufficiency of cattle or manure, unsuitability of soil." Is black cotton soil not so deep as a rule in Ahmednagar as to block irrigation or make it unnecessary?—I think not.

8. Q. There seem to be several varieties?—There are three, I believe, recognized by the *Gazetteer*.

9. Q. It is generally the depth that is put before us?—In Ahmednagar black soil is not very deep. The *Gazetteer* distinguishes three kinds by colour.

10. Q. It is your belief that water being given, irrigation should be pursued on a larger scale than it has been?—I think it depends on the enterprise of the people; if they are enterprising, there would be no obstacle.

11. Q. By storage of the water in the hills you could very largely increase the canal irrigation; there is not a great deal of exertion required on the part of the people; your district is fairly flat?—Yes, I understand with irrigation you must manure the soil and treat it properly; I question whether the people in Ahmednagar have enough enterprise to do that properly.

12. Q. Your population is sparse, comparatively speaking: 127 to the square mile?—Yes.

13. Q. You say, "Loans under the Land Improvement Loans Act are freely offered and taken. More could, I think, be done if the preliminary enquiries and the distribution of the money were entrusted to a properly organized establishment with nothing except *takavi* work to do." Would you have an establishment to go from district to district?—No, you would have a separate establishment for the district, as was done in the famine; it is not always done; we have been able to advance large sums.

14. Q. Would you have an Assistant Collector for the purpose?—I think a *Mamlatdar* could manage each *taluka*.

15. Q. A separate *Mamlatdar* for *takavi* alone?—You might give the work to a head *karkun*, but for large sums it would be better to employ a highly paid man.

16. Q. Could the *Mamlatdar* do that and nothing else?—There would be enough work for him for a couple of months in the *khari* and a couple of months in the *rabi* seasons.

17. Q. It would only be for a certain number of years?—As regards wells, I think the limit has almost been reached by reason of the sinking of the water level; there is not much scope now; it would take two or three years of good rain for the levels to rise again.

18. Q. When the water is low, there is not much inducement to sink wells?—There is not much profit.

19. Q. You show in your memorandum 3 that the area irrigated from wells dropped from 126,581 acres in 1896-97 to 59,703 in 1900-1901, which seems to point to the drying up of the wells. I suppose the dearth of cattle has had something to do with that?—There was not a very great dearth of plough cattle; the famine did not have much effect on the wells; in some places the famine gave a great impetus to wells; they demand wells now; but the question is whether there is much object in building them, as they give out in the hot weather.

20. Q. According to your figures, they did very good work in the first two years from 1898 to 1900?—Yes.

21. Q. You say that wells held out a year after *bandharas* had failed; that shows they exercised some influence over the situation?—Yes.

22. Q. (*Mr. Ibbetson*).—Is the 2½ million acres referred to in your report culturable or cultivated?—One hundred thousand is cultivated.

23. Q. (*The President*.) You say talking about *takavi*, "the rules already allow a period of 20 years, though in practice the term is frequently not made as long as it might and ought to be;" why is that?—I don't know; the *Mamlatdars* have a tendency to contract the term that could be remedied by executive orders.

24. Q. You say only one new *bandhara* has been constructed?—Yes, that is on an agricultural farm belonging to the American Mission by Mr. Ballantine, a very enterprising man.

25. Q. You say, "Irrigation from private channels is often supplemented by well irrigation. The people have a theory that canal water is too cold for the land, and that well water is warm and counteracts the 'bad effects of canal water.'" Do they pump the warm water after the cold?—Yes.

26. Q. And thereby give too much water?—I have no personal experience of that; I have been told so.

27. Q. You say, "The only tank in the district is the Bhatodi tank, which is under the control of the Public Works Department." Are there remains of old tanks or any indications that it was a tank district?—No, I believe some village tanks were constructed in the famine of 1876, but they have all gone out of use.

28. Q. (*Mr. Ibbetson*.) Is that for drinking or irrigation?—I am not sure; I think for drinking for cattle.

29. Q. (*The President*.) They have not been kept up?—No, probably they were not well constructed.

30. Q. *Takavi* loans are given for many things besides wells; what are they chiefly?—Seed and cattle.

31. Q. (*Mr. Muir-Mackenzie*.) Are they ever given for manure?—No, I think not; certainly not expressly.

32. Q. (*The President*.) Is any artificial manure used?—No.

33. Q. (*Mr. Muir-Mackenzie*.) Not castor cake?—No.

34. Q. Nor fish manure?—I won't answer that in the negative, but I never heard of it.

35. Q. (*The President*.) You say in your note "the assessment on land irrigated from wells is not much higher than the dry crop rate. It ranges from Rs. 2-7-0 in Akola to Rs. 0-5-0 per acre in Karjat." That is extremely low?—Yes, it is very low throughout the district. Karjat is a poor *taluka*. That paragraph refers to land irrigated on wells. Karjat is about the worst part.

36. Q. Was there great loss of life in Ahmednagar during the famine?—The last census shows a decrease of 50,000, but I think a large proportion of that went to the Nizam's territory; the decrease was chiefly in the border *talukas*; at that particular time labour was to be got in the Nizam's territory.

37. Q. From your experience what do you think would be the best protective measure for Government to adopt to make your district better fitted to withstand a famine, than it was three or four years ago?—I think there is only one, to utilize the streams and nullahs.

38. Q. That is, to store the water instead of allowing in to go to waste?—Yes.

39. Q. (*Mr. Muir-Mackenzie*.) You would not advocate the multiplication of wells?—Certainly not at present. I think the sub-soil water will not rise for some years; it is sinking fast.

40. Q. I suppose that materially diminishes the number of wells working?—Yes.

41. Q. (*Mr. Higham*.) Can you say what is the actual area cultivated in Ahmednagar in the worst famine years?—I'm afraid I have not the figures.

42. Q.—I suppose there are figures?—(*Mr. Muir-Mackenzie*.) Only figures of the area sown could be given, not of the area that comes to maturity.

43. Q. With reference to the *bandharas* that you refer to, what rivers are they situated upon?—They are situated on streams, tributaries of the rivers, not on rivers.

44. Q. There are none for instance on the Mula river?—I cannot say.

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45. Q. (Mr. Muir-Mackenzie.) Are they *pakhbandhas* or *kachcha*?—They are *kachcha*; they have to be repaired every year; they are kept up by the villagers.
46. Q. (Mr. Higham.) In the event of storage works being constructed, the immediate result would be to greatly benefit these *bandharas*, by giving them a regular supply?—Yes, if you had *bandharas* on streams.
47. Q. Suppose you had a *bandhara* on a stream at the head of which you could construct a storage work, the efficiency of that *bandhara* would be greatly increased, but would Government have any means of getting any revenue on account of that. The revenue is fixed on this *bandhara*?—Yes, there is a consolidated revenue on the *bandhara*.
48. Q. If we were to store water at the head of the river, the *bandharas* would get a much better supply, and we would be able to get nothing out of them; they would get the first pick of the extra supply?—I suppose so.
49. Q. (Mr. Muir-Mackenzie.) If there was an increased area brought under cultivation, Government would be able to charge revenue on that?—Yes.
50. Q. (Mr. Higham.) You say that the approximate average annual rate charged by Government for the use of water taken through these private channels is Rs. 2-13 per acre. That includes the soil rate also?—Rs. 2-13 is the whole rate.
51. Q. I see that Mr. Lamb very strongly recommended the construction of the Maladevi tank; do you agree in his opinion that it should be done?—Entirely.
52. Q. Do you think if the Maladevi tank was constructed and a regular supply down the Pravara river, there would be any demand for water in ordinary wet years?—I think experience says no. I suppose there would not be very much demand in a good year.
53. Q. People can get very good crops without irrigation?—They can get enough; they are not ambitious.
54. Q. Don't you think they would endeavour to introduce a higher class of crops if they could get an assured supply of water?—Not on a very large scale.
55. Q. You think the mass of the people would be content to get their crops without paying a water rate?—I think so; I think they would only take water on a large scale if rain threatened to fail.
56. Q. What do you say about the Visapur tank?—I suppose the same remark holds good.
57. Q. I don't mean whether the people would take water, but whether it would afford any protection at all?—Undoubtedly; I think the tank will fill.
58. Q. Do you think it should be completed?—Yes, undoubtedly.
59. Q. How long have you been in the district?—Ten months altogether.
60. Q. Have you seen anything of that work?—Yes.
61. Q. As a relief work, has it been a good work for employing labour on?—Capital; we have had 11,000 people on it for a long time.
62. Q. Would you like to keep it in reserve for another famine or complete it at once?—I should complete it at once.
63. Q. (Mr. Ibbetson.) You said just now that in a good year people would be content without irrigation?—That is my private opinion.
64. Q. Can you give us any idea what proportion of years would come under that description of "good" years; out of five or ten how many?—No, but the bad years come in cycles in Ahmednagar; the last six years have been all bad years.
65. Q. We have been told that in the Deccan out of five years there is one good crop, two middling, and two bad; does that apply to Ahmednagar?—Yes.
66. Q. Does that apply to the *rabi* also; do they grow their *rabi* ordinarily on rain only?—No, only the best soil grows *rabi* without rain; at the end of the year their *rabi* has to be irrigated from wells.
67. Q. Supposing water was available from a tank or canal, would they take it in an ordinary year?—Yes, for the *rabi*.
68. Q. Do you think that the *rabi* area could be extended if they had plenty of water?—I think it very likely if they were not hard pressed; when there is a famine, they try to get some crops at once.

69. Q. You say in your note "I do not think the fear of enhanced assessment enters into the farmer's calculations in deciding whether he shall build a well or not." Do you think that that consideration does not weigh with him one way or the other, or is it the case that he has no fear that there will be enhancement?—Partly both, partly because he is reasonably sure of making enough profit.

70. Q. You don't think he knows for certain not only that it won't be high, but that there won't be any at all?—I don't think he knows the law.

71. Q. Still you don't think that such fear as he has ever prevents him from making a well that he would otherwise make?—No.

72. Q. You say "I would recommend a partial remission (not a total remission) of the advance in case of failure to obtain water." We have been told by many witnesses that they object to that on the ground that it would lead to extensive fraud; it would be impossible to find out how much the man really spent on the well or on a marriage; etc.; do you think that would be a practical obstacle?—I think not if there was a special officer who had time to enquire into these matters.

73. Q. Do you think an enquiry should be made?—Yes.

74. Q. Your wells irrigated 65,797 acres in 1895-96 and 126,581 acres in 1896-97; that was a famine year?—Yes.

75. Q. Does that mean that your wells had not been fully worked before or that a great number of new wells had been dug?—A very large number were dug.

76. Q. Then they must have been made *kachcha*?—Yes; they struck rock very soon.

77. Q. You say in your note, "A grant-in-aid might usefully be given to a man who has already dug a well by means of a takavi loan and requires more money to complete the masonry?"—That seems to me a most admirable suggestion.

78. Q. (Mr. Muir-Mackenzie.) Do you mean without repayment?—Yes.

79. Q. (Mr. Ibbetson.) Can you say how many of these wells in 1896-97 were dug quickly and left just as they stood?—I cannot say.

80. Q. Were many left in that way?—I cannot say.

81. Q. You say, "No irrigation works have been constructed during the recent famines by the Revenue Department. The protective value of the completed irrigation works in this district was very small. Which do you refer to?—To the Ojhar left bank and the Lakh canal, also the Bhatodi Tank.

82. Q. What happened to them that they were not a success?—The water-supply failed.

83. Q. I suppose there was some water?—I think not; the supply failed early.

84. Q. You say, "The approximate average annual rate charged by Government for the use of water taken through these private channels is Rs. 2-13 per acre." Can you say how much of that is for water and how much for land revenue?—No, the figures are available in the village records.

85. Q. Is that consolidated?—Yes.

86. Q. We have heard that Re. 1 is taken on account of water; do you think that a substantial reduction of that would stimulate the construction of these *kachcha bandharas*?—No; there is no co-operation among the people.

87. Q. As a fact, they do make these *bandharas*; why should they not control their distribution in more cases?—Because there are no more streams, there is no more room; whatever little water there is is taken up.

88. Q. Have these streams been examined professionally?—No, my point is that there is no more water for the *bandharas*, not that there are no more sites.

89. Q. You say, "Many of the old dams, however, require repairing, and Government might usefully undertake the repairs." What is the use of them if the water is already taken up?—Well, I think it is possible some of these would be more useful if they were thoroughly repaired, the villagers are not intelligent enough to repair them themselves.

90. Q. (Mr. Muir-Mackenzie.) I understood they were all *kachcha*?—Yes; I believe so, there are two dams in Akola, which have been repaired by the Public Works Department; the Savagon is one.

91. Q. (Mr. Ibbetson.) Would these *bandharas* be second class irrigation works?—(Mr. Muir-Mackenzie.) Not unless they are in charge of the Public Works Department.

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92. Q. Can you suggest any reason why tank irrigation is practically unknown in Ahmednagar?—I suppose it is the conformation of the ground.

93. Q. Have you any country which *prima facie* would be suitable for tanks?—Do you mean tanks like those in Konkan for storage of rain water?

94. Q. I mean some with catchment areas of their own?—I think there are plenty of sites.

95. Q. Why are they not made use of as is done elsewhere?—I suppose they were beyond the means of the people.

96. Q. Do they grow rice?—Yes, in Akola only.

97. Q. Are there any tanks in Akola?—No, my opinion is that a couple of good showers would fill any of these village tanks, but they dry up quickly.

98. Q. You say in your note that something like 1,000 new wells per annum have been made in the last five years?—No, during the five years ending 1896-1897; since that year 3,300 wells have been dug.

99. Q. So that wells were increasing at the rate of a thousand a year before the bad cycle came?—Yes.

100. Q. Looking at the scope of well irrigation and the fact that more labour, more cattle, and more manure are required, do you think that that rate of a thousand per year could have been advantageously increased very much, supposing there was plenty of money available?—I daresay I find that of the wells made since 1896-97 only one-half were made from takavi and the rest from private capital.

101. Q. One would think that the famine would apply a strong stimulus to the construction of wells?—It also dries up capital.

102. Q. Do you think that the number might have been largely increased if money had been freely available?—Probably more wells would have been constructed, but I doubt if the advantage would have been great, because the water level has been sinking so much.

103. Q. I suppose a well protects about 8 acres?—Yes.

104. Q. I suppose there are large tracts in Ahmednagar in which wells could not have been sunk, or profitably worked?—There may be fields, but not tracts.

105. Q. Do you think over the greater portion wells could be sunk and worked with profit if people had the enterprise and money?—I suppose they could if there was a supply of water.

106. Q. Supposing you made all the wells that a man could desire and that he could work with profit, what area could be protected; is one-tenth very much below the mark for Ahmednagar?—I question whether it would be more.

107. Q. You say in your note?—Any great increase in the number of new wells must await the replenishing of the sub-soil water-supply. That means until the present cycle is over and we get better years?—Yes.

108. Q. Have you experienced the sub-soil water-supply failing not on account of bad years, but because too many wells have been made close together?—No, I have not studied that question.

109. Q. Have you heard of it?—I have always assumed it as a fact; I have not enquired into it.

110. Q. You say, "Expert advice has not been provided, nor is it advisable that it should be provided." You say you have a boring machine already; is it for deepening a pit already dug?—No, it is a drill for trial boring.

111. Q. That has not been a success?—No, because it is so fragile. I think a long jumping bar is more suitable for a trial boring.

112. Q. Supposing that the machinery is simple and effective, would you say it is not advisable to get it?—You would want such a number, you cannot carry these things about like a jumping bar, and you would require skilled supervision.

113. Q. Would you recommend the provision of a jumping bar?—We have one in every *taluka*.

114. Q. Are they much used?—It depends on the Mamlatdar.

115. Q. Do you think people appreciate the use of them?—There is not much competition for them.

116. Q. Has there been a case in which it has been really useful and where loss of money has been prevented?—I cannot say.

117. Q. (Mr. Rajaratna Mudaliyar).—You say, "The area protected by Government irrigation works is 6,000 acres."

Do you mean by that protected in all seasons, or do you refer to the irrigable area only?—It means the area actually irrigated. I suppose commanded is the proper expression.

118. Q. In a famine year the whole of that area will not be irrigated?—No.

119. Q. You say "the rate of interest is low enough, and I do not recommend a reduction. The lowest rate at which landholders with the best security can borrow in the market is 12 per cent." We have been told that agriculturists find difficulty in borrowing owing to the power of alienation having been restricted. Is there any truth in that statement?—It is too early to say yet; I think the matter will right itself; there has not been much borrowing since the Act was passed.

120. Q. It is due to the famine?—Quite as much as to the recent Act; partly, too, the season of making wells is only now coming on.

121. Q. (Mr. Muir-Mackenzie.) As a matter of fact, the area on which alienation was restricted in your district is insignificant?—Yes.

122. Q. (Mr. Rajaratna Mudaliyar.) You say, "Land found at the settlement to be irrigable from these channels was classed as '*patasthal*' and assessed with regard to both soil and water." All such lands are, I suppose, liable to pay a consolidated assessment, whether irrigated or not?—All those found irrigable at the settlement.

123. Q. Is any large portion of the land left unirrigated?—No, I think not; if they cannot get water, they can apply to the Collector, and with the approval of Government get the consolidated rate removed.

124. Q. What would be the reduction in the consolidated assessment in such a case?—I think the water rate is represented by about Rs. 2.

125. Q. You say "the approximate average annual rate charged by Government for the use of water taken through these private channels is Rs. 2-13-0 per acre," and you explain in a marginal note that it varies from Rs. 6-8-0 to Rs. 0-11-0, why does it vary so much?—(Mr. Muir-Mackenzie.) According to the character of the supply.

126. Q. Supposing that a rayat irrigated a portion of private land by means of *bandhara* constructed at his own cost, what would he be charged?—The rule is that an officer goes and inspects the *bandhara*, discovers how long the supply is likely to last, its capacity and the area it irrigates; he then puts on a rate conforming to that of similar *bandharas* that were assessed at the last settlement in the vicinity.

127. Q. Referring to the Bhatodi tank, I find the revenue is given in Mr. Beale's statement as Rs. 5,799, while the working expenses amounted to Rs. 7,723; what is the reason of that?—I think the silting up of the tank had something to do with that; the Public Works Department will be able to explain.

128. Q. Referring to statistics of area irrigated under wells, do you think the figures can be accepted as reliable?—I think the figures are approximately correct; there is a triple check on them, the figures being checked by the Mamlatdar, Assistant Collector, and Circle Inspector.

129. Q. (Mr. Muir-Mackenzie.) About these wells, I see you have given an increase in their number between 1896-97 and 1901-02; that increase began with 1897-98?—Yes.

130. Q. In contrasting the number of wells that have been made during that period with the number that have been made during the five years previous, it must be remembered that a large number of wells were made in 1896-97?—Yes.

131. Q. Then again, I notice, that in the famine year you had 1,234 *pakka* wells; is that so?—That is not for that year alone; that is a statement compiled in that year, which shows the wells constructed since the last famine—since 1896-97.

132. Q. As regards manure, did you say that you noticed the people are buying cake?—No.

133. Q. I think I have heard that they are; have you heard that there is any conservation of refuse and night soil in the villages going on?—No.

134. Q. It is not only going on in the town, but also in the villages they are beginning to learn?—I have not noticed it, but then I have not toured very much in Ahmednagar.

135. Q. Do you think that the system of assessment of rates varying with the crops, so much for rabi and monsoon crops, etc., and determining the amount of assessment by inspection is in every way a suitable system, or do you prefer the Sindh system of a consolidated rate?—I think you would have to split up the numbers.

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136. Q. If you split up the numbers?—I think the Sindh system is probably better, as it does away with the chance of fraud on the part of the subordinate agency. I think the management of these works by the people themselves is better if it could be done.

137. Q. Can you suggest any method by which it could be done?—Not on a big canal, but on village works and small tanks; the people are certainly better qualified to manage the distribution of water themselves.

138. Q. The small tanks are under the Public Works Department?—Yes; for instance; the Gonda tank; the Public Works Department repair it and the villagers manage it.

139. Q. Would you prefer to see extended the system of village management?—Yes.

140. Q. (Mr. Ibbetson).—That implies fixed assessment?—Yes.

141. Q. (Mr. Muir-Mackenzie).—You said that experience seems to suggest that irrigation from these Government works would not be much resorted to in good years; I want to know what experience?—Well, I cannot say I have had much experience.

142. Q. It is more an impression than experience?—Yes.

143. Q. You have never, for instance, studied the progress of irrigation on the Nira Canal?—No.

144. Q. You said that the Visapur tank would fill; what do you go upon; the aspect of the country does not seem very inviting?—I have not studied the question; I have noticed the floods that go down; I think they are sufficiently large to fill these tanks.

145. Q. Do you think that was a good selection for relief labour, or would you prefer to see it concentrated on another tank, say the Maladevi tank?—Yes, I presume I should if it were practicable; the Maladevi is certain and the Visapur is not certain.

146. Q. Do you think the Visapur was taken because there was no alternative?—I cannot say.

147. Q. Is there any other form that you can think of in which famine relief work could be employed to advance irrigation as advantageously as these big tanks?—No.

148. Q. What about *thals* terracing the country?—I personally prefer tanks, large and small.

149. Q. Bunding up of small streams?—Well, I was thinking more of bunding up *nallahs* which carry off flood water.

150. Q. Would it be compatible with effective supervision to do that as a famine work?—I think so; it is a question of establishment.

151. Q. You think that the period of repayment of *takavi* advances for well building should be extended?—I think the *Mamlatdars* don't make the term long enough in many cases.

152. Q. Can you give any reason why a restriction should be made; why not give as long a term as the *rayat* wishes?—I think there should be a limit.

153. Q. Why, suppose he pays the interest?—Would that not reduce the amount of money available with Government for loan to other people?

154. Q. Allowing that Government might have to consider that, we hear that rigidity in the collection of instalments is one of the great drawbacks to the system, so long as the interest is paid, why not allow the *rayat* to postpone the repayment of his instalment; do you think he would look upon it with satisfaction?—I think he would; I was thinking of the objections from a revenue point of view; I have not considered the question.

155. Q. (Mr. Ibbetson).—Can you say what the ordinary cultivator has to pay for loans from a *bania* to make a well?—Generally by 24 per cent.

156. Q. Have you given *takavi* this year for wells?—No not yet, the time is approaching.

157. Q. Do you propose to lengthen the period for recovery beyond what the *Mamlatdar* recommends?—I propose to issue orders to the *Mamlatdar* to that effect.

158. Q. The Collector has full power?—Yes up to 20 years.

WITNESS No. 53.—REV. H. FAIRBANK, American Mission, Vadala, Taluka Nevasa, District Ahmednagar.

Answers to printed questions.

I.

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2 The soil in the Ahmednagar district varies from heavy black soil to light and sandy. In an ordinary good rainy season no portion of this soil is dependent upon irrigation except for special crops, as sugarcane, lucerne, etc. The *kharif* or rainy season crops are planted from the 1st of June to the end of July in the light soils, which require repeated rains and which do not become water-logged. The *rabi* crops of *juari*, wheat, and gram are sown in September and October on the heavier black soil, which needs no rain to develop a crop if it is once saturated. Cotton is sown in June on black soil and flowers in September and October. The *kharif* crops are not watered in ordinary years. *Juari* and wheat are both watered whenever it is possible to do so. *Juari* is watered three or four times, November to January. Wheat needs more water if it is watered at all. Both *juari* and wheat give good returns on black soil without irrigation. By watering the yield may be doubled and the size and weight of the grain may be very much increased. Crops that must be watered are sugarcane (very often), red peppers, lucerne grass and all garden vegetables.

3. There are no tanks that I have seen constructed in deep black soil. There may be a black soil embankment, but the bottom needs to be rocky. (There are small tanks at Bahmani, Vadala, Takli-Bhan, Bhokar, etc.) None of these tanks are used for irrigation, but are used to supply drinking water to cattle and for bathing. Even in the richest black soil *juari* and wheat are irrigated, if possible. The owners of fields along the Lakh Canal use water whenever there is enough. In good years it is used freely. In years of drought it would be used still more freely, I have no doubt, if the supply were abundant. Irrigated lands need ploughing often and to be manured; otherwise they soon are exhausted.

4. The only work of importance that I personally know of is the Lakh Canal. This canal has little water in times of drought. Tanks such as are now being built or proposed near the sources of the Mula and Pravara promise to be

of great use in storing water for other reservoirs further down the stream.

6. There are no small tanks in this district used for irrigation. Those now in existence supply drinking water to cattle. There are not any of them, as far as I know, of Government construction. Some are the pits of quarries. The configuration of the land prevents the construction of large tanks except at the base of hills or in the beds of rivers. Tanks at the base of the hills extending east from Vambori would be useful for irrigation. In the hilly districts of the Parner and Nagar talukas such tanks should be feasible and useful. The rivers generally run very low compared with the surrounding territory, and canals from them would be limited in usefulness. Storing water at intervals in these rivers would serve the purpose of supplying water to wells near the riverside. Such wells were used very freely in 1897 and 1898. Since then the rivers have run dry, and the *bhudkis*, as they are called, have been useless. Dams at intervals across the many streams that run from the hills on the south to the Mula, the Pravara, and the Godavari Rivers would have been of untold value during the last five years, for an enormous amount of water runs to waste through these streams. The channels of these streams are deep and narrow at many places. As already mentioned, the small tanks scattered through the district have been useful in supplying water for cattle. They become so foul that men will not drink the water.

7. Wells supply practically all the water used in irrigation in this district. In addition to wells existing before the famine, many new wells have been dug by means of *takavi* loans, and old wells have also been deepened. It is a pity that many farmers have squandered the loans given them, but still the amount of good accomplished has been great. It should be remembered also that wells are expensive, and that 500 rupees may be practically useless without another 100 rupees to finish the job. I know of wells that are built up and in which there is a little water.

Another loan of a hundred rupees would probably make these good wells and double and treble the value of the land; without this sum, the well does nothing. Improper use of takavi loans may be partially prevented by giving the money in instalments and requiring the first instalment to be properly used before another is given. It should be remembered, however, that some of the first instalment of takavi invariably goes into the pockets of the patel and kulkarnis. Towns favoured by good wells have preserved their cattle alive, and their inhabitants have not been on relief camps, e.g., the town of Jeur in the Nagar taluka and the towns along the Sina River below Ahmednagar. On the other hand, wells have their limitations. The last two years have seen a great diminution in the amount of water in the ground. Some wells have dried up altogether, and the capacity of most has been reduced to one-fourth, or even less, of the ordinary capacity. The ground seems to have dried up clear down. Some wells have been deepened with excellent results. The majority of those deepened have been helped. Wells 60 or 70 feet deep are profitable if they have abundant water. In some towns water lies within 20 or 25 feet of the surface; such towns are few. The average well is over 30 feet, down to 50 feet, deep. A good well cannot be dug for less than 500 rupees ordinarily. Many cost up to 1,000 rupees. A well that will water 10 acres adequately is rare. It should be remembered, however, that sugarcane and garden vegetables need very much more water than jauri or wheat. So the statement as to the amount of land that one well will water depends on what crops are meant. There are one or two wells that I know of that are said to water 20 or 25 acres, but a great part of this land is in jauri and wheat. There is not an unlimited amount of water in the ground. An increase of wells in many cases decreases the supply of old ones near by. This is especially the case when there is a porous stratum through which the water comes. There is plenty of room, however, still for new wells, as most wells are at present close together near the villages. If more wells could be dug at a distance from the villages, they would in many cases tap new streams and sources of water.

II.

A.—GENERAL.

I have knowledge of the Nevasa taluka in the Ahmednagar district and of parts of the Nagar taluka.

3. There is no obstacle to the extension of irrigation—

- (1) from sparsity of population,
- (2) from insufficient supply of cattle.

There is an obstacle at present because cattle have died in the famine. Before the famine there were enough.

- (3) At present manure goes to waste. Increase of irrigation will bring in more cattle and increase the amount of manure.
- (4) Soil (even *black cotton*) is suitable for irrigation if worked properly and manured.
- (6) If the supply of water were insured, I believe that there would be capital to invest. There might be trouble about the initial expenditure in the present poverty of the farmers.
- (7) No one ever has mentioned this fear to me.
- (8) Not that I know of.
- (9) Wells are expensive to operate, and this does in good years prevent extension of irrigation for the more expensive crops as sugarcane, etc. The fact that farmers have not credit with money-lenders on account of laws enacted in 1879 and lately is given as a reason for their not being able to obtain money when needed.

1. Q. (The President.) You are, I understand, a Missionary in Vadala?—Yes.

2. Q. How long have you been there?—Since 1886; I have had more or less experience there.

3. Q. Were you there through the famine?—I was through the first famine, not the last.

4. Q. Have you studied agricultural matters?—My father was very much interested in agriculture, and as I go round I notice things, but I have no scientific knowledge.

5. Q. (The President.) You say in your memorandum, "In an ordinary good rainy season no portion of this soil is

5. Loans have been freely taken by the people for digging wells; and a great many wells have been dug.

- (1) Perhaps the rate of interest could be reduced.
- (2) The interest should not be entirely remitted.
- (3) and (4) Remission, partial or total, in case of failure to obtain water might be a good thing for those who have honestly tried to use the loan, but the trouble would be that a general policy would lead to abuse of takavi loans.
- (5) I believe that the period of repayment of present loans should be extended on account of the distress caused by the famine.

6. Extension of irrigation has not, as far as I know, tended to injure the remaining cultivation.

The increase of irrigation is greatly desired.

E.—WELLS.

24. In the Nevasa taluka—

- (1) Wells average from 30 to 50 feet deep.
- (2) Water comes both from springs and from percolation according to the nature of the ground.

They do not fail except in severe drought. There are tracts where the water becomes too saline to use. Such are avoided by the people in digging new wells. Any well will gradually diminish in capacity through the hot weather even in ordinary seasons.

Wells through this district within 12 months have very seriously diminished in capacity. Many have only one-fourth or less of the water of ordinary years. In some towns wells have practically dried up.

- (3) Wells cost from 500 rupees to 1,000 rupees.
- (4) A well once built should last for ever.
- (5) Water is drawn here always by a leathern bag called a *mot*.
- (6) The capacity of a well is measured by the number of *mots* that can be used on it.

One *mot* will water 3 or 4 acres of jauri or wheat, but less than half that of sugarcane or garden vegetables.

35. Irrigation increases the value of the produce.

- (1) Two harvests are possible. Generally bajri or khondi is planted in the rainy season followed by wheat or gram.
- (2) Sugarcane and pea-nuts, etc., are substituted where the farmer can bear the initial expense.
- (3) The yield of jauri and wheat is increased, and the size and weight of the grain are increased.
- (a) In a year of ample rainfall, the yield is sometimes doubled or at least becomes half as much again.
- (b) In a year of scanty rainfall, instead of a poor crop a good crop can be obtained.
- (c) In a year of drought, in place of nothing a fair crop at least may be obtained.

38. (1) Where there is rock to be blasted, there the digging of a well is a kind of lottery. You may strike a spring and you may not.

When there is a porous and soft substratum, there a well can be sunk almost anywhere, and water obtained.

(2) Wells dug in deep loose soil are difficult to wall up.

40. Temporary wells are not in use in the Nevasa taluka, because the water lies too deep below the surface.

dependent upon irrigation except for special crops as sugarcane, lucerne, etc.?—Yes, crops are raised anywhere in an ordinary season without irrigation.

6. Q. Does that include ordinary *rabi* crops?—Yes.

7. Q. You talk about the ordinary rainy season; up to when does that mean?—They get the heavy rains in September.

8. Q. If there is no rain after the 1st of October?—If the rain begins on the 1st of June and lasts to the middle of August, and then there is a break, and the heavy rain comes in September, these are sufficient for the *rabi* crops.

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9. Q. I suppose the soil is so saturated that there is no difficulty about the sowing?—No, there is difference in the soils; on light soil you can sow a day after the rain, but not in heavy soil; you must wait.

10. Q. What is the last date that they sow *juari* and wheat, assuming that the rains have lasted to the end of September?—*Juari* in the last week of October and wheat not before the end of October.

11. Q. Will the heat of October not burn up the *juari*?—No, it is better to sow at the end of September, but they can sow it at the end of October, as soon as the ground is in proper condition.

12. Q. You have had experience of a district that has suffered severely?—Very severely, I have made enquiries as I toured and have not been able to discover a single death from starvation, because everybody who needed it went on relief works.

13. Q. Do you think the relief works saved the lives of the people?—Yes, possibly there may have been one or two deaths from actual starvation.

14. Q. One may gauge the intensity of the famine here not by the terrible loss of life that occurred elsewhere, but by the extent of relief works that saved lives?—Yes, Ahmednagar stands at the head in the matter; without relief works there would have been terrible loss of life.

15. Q. What would you recommend Government should do to render Ahmednagar better able to stand a famine if it came on again; I don't mean relief works, but preparatory measures against famine?—I believe if the Visapur and Maladevi tanks and the new one near Rahuri had been in operation, they would have rendered very much help, than the damming of nullahs would have helped; some are flowing streams in ordinary years until April and May.

16. Q. They would not be in a year of drought?—They are flooded every year.

17. Q. Would you propose a series of dams across the beds of these streams? Do you mean temporary dams?—I am not in a position to answer. I don't think a temporary dam would do, because the floods are very severe.

18. Q. Would you advocate a series of masonry dams across the beds of these streams to keep up the water?—It seems to me it would have been a very great help in these past five years; this year the people have not water to drink, whereas if there had been these bunds, there would have been abundance of water.

19. Q. Above each bund would be a reservoir?—Yes.

20. Q. Would not the water be run off too quickly if used for irrigation?—I don't think it could be used for irrigation.

21. Q. You don't propose to make channels?—In our district the rivers run low, and it is very difficult to get channels from these streams.

22. Q. It would merely control the velocity of the water so as it should saturate deeper and deeper into the wells?—Yes and store it.

23. Q. I presume you would have a great increase in the number of wells?—Yes.

24. Q. Supposing that you had as many wells as you want, what proportion of the land would be put under cultivation in time of drought?—I have a very indefinite idea; for instance, I have three or four villages in my mind in which people did not at first go to relief camps. I was told that this year the water is failing in the wells, and people are for the first time now going in appreciable numbers.

25. Q. Do you suppose in any circumstances you could put one-tenth of the country under cultivation?—I think that would be a very high average.

26. Q. What you have spoken of is your first line of defence, then how would you proceed?—I think more wells should be dug; people dig wells only near the villages, the reason being that the crop that is at a distance is not secure from robbers.

27. Q. I suppose manure is got near the village?—Yes.

28. Q. (*Mr. Ibbetson.*) Don't they always keep a man on a well?—Yes, but what can he do against a set of thieves; my brother had a well at a distance of two miles, and there was a famine camp near by; he did not get a single ear of corn from his fields. People will not dig wells at a distance from the town, unless you can get them to come together and form a separate *akhara*.

29. Q. In your district can wells be sunk everywhere?—In low-lying places, but very often rock is met with.

30. Q. That is not an insuperable difficulty?—No, some of the best wells are blasted through hard building rock, you often strike excellent springs.

31. Q. Are you an advocate for the free grant of takavi to enable a cultivator to make wells?—I think takavi loans have done a great deal. I have had a good deal to do with Christians, and am sorry to say that they as well as others have used the money for other purposes; they simply make a little hole in the ground.

32. Q. Do you think that could be remedied by making a condition that a certain amount of work was to be done before the whole amount was given?—Yes, the money should be given in instalments; if work is carried out properly, then the remaining instalment should be given.

33. Q. Do you think the rate of interest deters men from taking takavi?—No, all say it is a most fair rate.

34. Q. We have had a proposal made that instead of getting repayment of loan Government should give the advance and then should assess the land instead for all future time at an additional assessment for wet land; do you think that would be popular?—I think if a good well was secured, the enhanced assessment would not be unpopular, because the value of the land has so much increased and so much more could be got out of it.

35. Q. You have heard that the water level has gone down very largely?—Yes, very largely, in the village where I live I put it at one quarter of the ordinary supply. We have lost three-fourths of the water. There is a well in my own farm that was running two *motes*; now it is dry.

36. Q. There the shallow wells are altogether dry?—No, it does not follow; some of the best wells running now are dry wells; it depends on the situation of the land.

37. Q. Is not the fact of the water having gone down so low a discouragement to the cultivator from taking takavi?—It is, no doubt.

38. Q. Wells are expensive in your district?—Yes.

39. Q. What do you consider the maximum depth at which they can be profitably worked?—Men will go down 60 feet.

40. Q. Is that a general statement or would only good cultivators do this?—Yes, it would not be everybody in the village who would do this. I have an instance of a man, in Vadala, who dug three wells; he had to give up two, and the third is 60 feet deep.

41. Q. (*The President.*) Is he a man of means?—Yes, he has done that entirely on his own account; that shows the value he attaches to a good well.

42. Q. Is there any artificial manure in your district?—No.

43. Q. Have you any experience of a tank district?—No, I have not lived in a tank district; we have a tank in Vadala. In a year of abundant rain it will fill up and can be used for a couple of weeks. This year there has been 19 inches of rain, and that tank has not filled up. The trouble is that there is no catchment area; that is the trouble, everywhere.

44. Q. That is an object that indicates an error in the selection of a site, but not in the principle of having tanks?—No, there is no place around Vadala where you could get any site.

45. Q. Suppose you store the water where the rainfall is heavy?—It would be a very good thing. If the Maladevi had been used, it would have been of great value.

46. Q. Do you give a prominent place to the construction of such reservoirs in the question of the defence of your district against famine?—Yes, the new Musalwadi tank near Rahuri will be of great value; there must be a place above from which it can be reinforced.

47. Q. Supposing Government went in for a scheme of that sort, would they be met, do you think, by discouragement, by the ordinary cultivator, saying "I don't care to pay Rs. 2; it will perhaps rain; I won't take water." If the water is only to be taken once in five years or so, there is not the same inducement to Government; will the cultivator get used to it and take the water?—I have had a little experience; in years past the chief difficulty was the uncertainty of the supply; when the cultivator wanted it, he found he could not get the water. At Panchegao it was found that once you begin watering, you must keep it up.

48. Q. You think that the security of supply is the essential thing?—Yes, sugarcane has to be watered once in every four days, at least once a week.

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49. Q. (Mr. Muir-Mackenzie.) You don't think they could do with less water than they take?—Mr. Knight thinks the fields are overwatered; if a cultivator were used, less water would be needed. The trouble with sugarcane is that you cannot get into the field to cultivate it.

50. Q. Have you heard that they water cotton?—They say irrigation produces disease in the plants.

[(The President.) In Egypt it is watered once a fortnight steadily?—(Witness.) I only say what I have heard.]

50a. Q. (Mr. Higham.) None of these public works that have been proposed, the Maladevi, etc., would be of any benefit to Vadala, would they?—Yes, the canal from the Baragao Nandur Tank near Rahuri would go within a mile of it.

51. Q. You say in your memorandum, "The *kharif* or rainy season crops are planted from the 1st of June to the end of July." I suppose there is no rice cultivation?—Yes, in a good season they plant a very coarse sort of rice that does not need much water.

52. Q. I suppose the reason is that there is generally not enough water for it?—Yes.

53. Q. If a more regular supply of water were given by means of tanks, do you suppose that any of this *kharif* cultivation would be converted into rice cultivation?—I cannot say. I rather think not; instead of going into rice, they would go into sugarcane, red peppers, ground nuts, and garden vegetables; wherever there is a well, they plant these things.

54. Q. You don't think there is much danger of the land being converted into rice cultivation land?—No, our people don't enjoy eating rice.

55. Q. Do they grow cotton?—Yes, a great deal.

56. Q. (Mr. Muir-Mackenzie.) Is it much?—It varies from year to year; their idea is that cotton has to be sown before the end of June, and requires heavy rain in June.

57. Q. (Mr. Higham.) These bunds across the stream would not store water?—Yes, they would.

58. Q. What height?—In some places 10 to 15 feet high.

59. Q. The water would be simply storage and allowed to percolate through?—Yes.

60. Q. You would not lift it out?—No, except by wells at the sides; I think, it would help existing wells; the principal use would be to help wells near by the river, I think anybody who uses a *kurki* or a well fed by a running stream, is charged an extra rate.

61. Q. (Mr. Ibbetson.) Do you think that the charge for the use of water of a running stream prevents the people from using it materially?—No, it is not a high charge.

62. Q. You consider that in a good year crops can be grown anywhere without irrigation; still irrigation would improve the crops in the best of years?—Yes.

63. Q. You spoke of the uncertainty of the supply of water; suppose the supply was absolutely secured, do you think that they would use it in the best of years for the sake of that improvement?—Yes.

64. Q. If the supply was secure, they would take all the water that could be given?—I believe so, they would then cultivate more expensive crops, but they would also irrigate the *rabi* crops.

65. Q. You say you have heavy black soil in Ahmednagar; is a large proportion of the culturable area on that?—It is in spots and villages; it is most prevalent near large rivers.

66. Q. Is there an extensive area altogether?—At Vadala there is not much, at Kharvandi half is black soil.

67. Q. Taking the whole district, roughly?—It would not come to one-third probably.

68. Q. At any rate, you put it at one-fourth?—Yes.

69. Q. Would they water heavy black soil?—Yes.

70. Q. What is the greatest depth of black soil that they irrigate?—I cannot say. Along the hills there is no black soil; there is some as you get away from the hills to the flat open country; some villages are entirely *kharif* and some entirely *rabi*; there is *kharif* on the high lands and *rabi* on the low.

71. Q. You say, "Irrigated lands need ploughing often and to be manured, otherwise they soon are exhausted." Do you say that from your own experience?—Yes, one year without manure made a difference.

72. Q. Is that poor soil?—It is the richest soil we have.

73. Q. What makes you think it is the absence of manure?—There is no other reason.

74. Q. (Mr. Mollison.) If you water black soil one year, you will get a good crop, and not the next year?—Cultivators say the same thing; they say manure would have prevented that.

75. Q. (Mr. Ibbetson.) Why, are there no small tanks for rice irrigation in Ahmednagar?—At Vadala I don't know of any place where you could have a tank.

76. Q. I mean village tanks to water say 70 to 80 acres?—I don't think you could get a place where you could store enough of water and raise it to flow off by a channel.

77. Q. You are not hopeful about tanks?—No, not about small tanks.

78. Q. A great number of wells were made in 1896?—Yes.

79. Q. Do you know how far they have been finished up with masonry as far as that is necessary?—I asked that question; the village officers said three-fourths had been finished.

80. Q. Do you think the remaining quarter has not been finished, because they are not good wells, or because there is difficulty about money?—I presume both.

81. Q. There has been a lot of money spent on these wells, and if they are left as they stand, they won't last; do you think it would be worth while to give small sums as grants-in-aid to put in this masonry and so make the well a permanent one?—Yes, I believe in good wells.

82. Q. Do you think the people would be ready to take the money as an ordinary takavi loan?—Yes.

83. Q. What is the difficulty? Rs. 300 has been received and spent; they still require another Rs. 100; would that be refused?—Yes, I know one man's application that has been refused by the Mamlatdar several times, I think also there is another reason: there has been a limited amount of takavi of recent years, and when new applications come in, they are given precedence.

84. Q. Surely it is better to give Rs. 100 to prevent Rs. 300 going to waste than giving a loan for a new well?—I think so; I know a village in which there are three wells, which it would cost very little to complete; until they are completed, they are useless.

85. Q. Do you think the people would be ready to borrow the money?—Yes, on all wells requiring Rs. 200.

86. Q. Have they asked for it?—I am not quite sure.

87. Q. Are you hard up for money for takavi, Mr. Brendon?—(Mr. Brendon.) No.

(Witness.) There is difficulty with the kulkarni; he demands money for himself, and would block the way. I think that is the real hindrance.

88. Q. You propose to give out money by small instalments as work goes on?—Yes.

89. Q. You say that some of the first instalment would stick on the way?—Yes, it always does.

90. Q. Would some of each instalment stick?—It would depend on how it was done.

91. Q. Would that not be a considerable difficulty?—It seems to me that Mr. Brendon's recommendation of a Mamlatdar going round and distributing money would be a capital one; it is the subordinates that keep the money.

92. Q. We have been told that the worry and delay of going to head-quarters would be an obstacle; still do you think the money would be given in small instalments?—I think it would be a balancing of advantages and disadvantages; this would be a disadvantage, but my plan would prevent the abuse of the money by the farmers.

93. Q. When did your wells begin to dry up?—They have failed very appreciably within the last 12 months; they began to fail in 1900.

94. Q. Have you had a year of good rainfall since 1900?—No.

95. Q. What is your average?—25 inches.

96. Q. Have you ever known wells so close together that they exhausted the subsoil water in ordinary years?—Yes.

97. Q. Supposing you had money to make wells in a suitable tract, what would you fix as the nearest they should be to one another, so as not to interfere with one another?—I have no data to enable me to say.

98. Q. You say, "There are one or two wells that I know of that are said to water 20 or 25 acres, but a great part of this land is in *juari* and wheat." Does it not pay the owner of a well to irrigate larger areas in that way than

Revd. H. Fairbank. smaller quantities of sugarcane?—That regulates itself; you will find very little sugarcane now; all the water goes to *juari*.

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99. Q. It is evident that it is a greater protection against famine; if we could get wells used in that way to irrigate large areas of *juari* and wheat instead of small areas of sugarcane, that would be an advantage?—Yes.

100. Q. What do you think will happen, will they stick to that or return to the smaller areas under sugarcane?—I think they will go back; sugarcane is a very profitable crop.

101. Q. At what rate can an ordinary man borrow money to make a well?—The rates are exorbitant; it depends on the security.

102. Q. A fairly solvent man, I mean?—24 per cent.

103. Q. Do you think that the 5 per cent. that Government charges ever prevents a man from making a well, who would make it if he could get it for less?—No.

104. Q. Why do you propose to reduce the rates?—In this way; that Government gets great benefit from that well in the value of the produce raised.

105. Q. Government, you think, could afford to be generous?—Yes.

106. Q. Still that would not increase the number of wells?—No.

107. Q. Would you extend the period of repayment of loans in ordinary years? Is the period too short?—I have not looked into that, but I don't think the period of 10 years is too short.

108. Q. Do you think they will begin to recover the advances too soon?—Since the heavy takavi loans have been given, there has been steady famine, and things have been very hard; I would like to see a few good years before I could say yes or no to that.

109. Q. You said there was a case you knew of a man who had made two wells and was now digging a third. Would it not have been possible in this case to have helped him with boring apparatus, to have made a trial boring in order to see what stratum existed below and what were the possibilities of water?—There are many wells in rocks, and there are streams that you might just miss. I have never seen it tried.

110. Q. Do you think it might be useful?—Yes.

111. Q. Did the man you spoke of come to any water in the first two wells?—Nothing worth while.

112. Q. And as regards the third well?—He drives his *mot* till 10 o'clock.

113. Q. How far is it from the others?—A mile.

114. Q. (Mr. Muir-Mackenzie.) How much did these diggings cost him?—About Rs. 700 each.

115. Q. (Mr. Rajaratna Mudaliyar.) Is there any impression among the people that there will be an enhancement of assessment if they sink wells?—I have never heard of it.

116. Q. You were permitted to construct a private *bandhara* at your own expense?—My uncle, Dr. Ballantine, did that.

117. Q. On what terms?—He did not ask for permission; it is on his own lands.

118. Q. There has been no enhancement of assessment?—Not yet.

[Mr. Muir-Mackenzie remarked that, if it was on his own land, there would be no enhancement.]

119. Q. The whole of that is his own land?—The catchment is his own, a part of it at the top might not be; it is like a *thal* on the side of a hill; it is not a stream; this year the *bandhara* has not filled up, and there is no flow from it, but there is an old well underneath it which has filled and which was not full before.

120. Q. (Mr. Muir-Mackenzie.) Would you advocate the multiplication of *thals* throughout the country?—The country is not steep enough for that.

121. Q. Terracing is a good thing?—Excellent.

122. Q. As a protective measure in time of drought?—It does not secure very much with us.

123. Q. Would you be disposed to apply to Government to give you takavi to distribute in your mission?—The difficulty would be the collection.

124. Q. The Revenue Establishment might collect it?—We would rather the Revenue officers looked after it.

125. Q. Why?—Because I should distrust my judgment. I should be afraid of being a little too soft-hearted.

126. Q. If you had the responsibility?—That is true, but there is the danger I mention because we have personal dealings with the people.

127. Q. I don't mean you should advance it to all the people, but only to your own?—The trouble would be that it would overwhelm us with work; we could not undertake it; my father tried the work of conciliation, and found it too much.

128. Q. Do you think it would be a good thing for Government to construct wells in the *rayats'* lands?—I don't see why it should not if Government can get a trustworthy staff to do it.

129. Q. The *rayats* would not object, would they?—I don't think so.

130. Q. Would it be more costly, do you think?—I presume it would cost more.

131. Q. How much more?—It would cost at least 10 per cent. more; still I don't know why it should cost so much, because it would be given by contract; the only trouble would be that there would be a sticking on the way with the underlings; the supervision would be expensive.

Witness No. 54.—Mr. L. M. Bose, Executive Engineer, Ahmednagar District.

Answers to printed questions.

I.

Paragraph II.

District.	Gross culturable area.	Gross area under command of Government Irrigation works.
Ahmednagar	4,214,478 acres	68,780 acres.
Khandesh		57,414 acres.

The actual area irrigated by Government works has never exceeded—

acres 9,400 in Ahmednagar District (1900-1901),

acres 9,741 in Khandesh District (1896-97),

both years of draught. Cause—paucity of water.

In addition to the above, there are 168 old second class *bandharas* in Ahmednagar supposed to irrigate 5,100 acres of culturable land in the talukas of Akola, Shrigonda, Nagar Parner, Karjat, and Kopergaon. With the exception of two, they are all temporary *earthen bunds* (renewed every year) across small early-dry streams, and since 1897 the irrigation under them has been almost *nil*, owing to the streams being dry. In Khandesh the *bandharas* are mostly of masonry across the large tributaries of the Tapti; the area irrigated from them is 22,180 acres. The works are important, and are repaired and improved by Government from time to time. Latterly there has been scarcity of water-supply, and the area has decreased. In Khandesh there is a large number of small village tanks that used to irrigate a few acres of land under them, and were also used for watering cattle, etc., but most of them have either silted up or fallen into disrepair. In Nagar there are very few such tanks. Of well irrigation I

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can only quote the following figures for a few talukas in Khandesh District :—

	Pakka wells.	Kachcha wells.	Area irrigated.
Dhulia	1,275	59	3,003
Malegaon	1,076	290	2,334
Taloda	30	10	33
Shahada	233	30	409
Sinkheda	978	115	2,036
Amalner	1,405	...	6,176
Savda	2,700	...	2,485
Chalisgaon	1,182	115	1,905

Well irrigation in Nagar district is comparatively small.

Character of the soil.—The chief soils for cultivation are: Black (Kali), Tambat (Red), Barad and Pandheri (White), and in parts of Khandesh Bhurki (white and salty). The sub-divisions are numerous and vary in different parts. Black soil is of two kinds, one known as black "cotton soil," a deep moisture-holding rich soil which yields a good crop of cotton, wheat and grain in average years of rainfall. Most of the eastern portions of Khandesh abound in cotton soil. The other is of a sticky and clayey nature, does not hold so much water, and is not so favourable for rabi crops without artificial watering. Pandhari and Tambat, although naturally poor and yielding coarser grain, such as bajri, juari and tili, will, with plenty of manure and water, bear heavy vegetable and sugarcane crops. Bhurki soil with plenty of rainfall will yield good cotton crops. In western portion of Khandesh and four talukas of the Upper Girna and Mosam Valleys, the agriculture has been greatly dependent on bandhara irrigation from pre-British period, and rice and sugarcane are extensively grown. Ordinarily, i.e., if the rainfall is average and timely water is not asked for monsoon dry-crops, such as bajri, tili and juari (coarser kind), during the southwest monsoon. Only fruit-trees and rich irrigated crops such as sugarcane, kamod (superior rice), plantain, pán, vegetables, etc., that require artificial watering during the monsoon, as the rain in the Deccan is not continuous, except on the Syhadri range. When there is a long break (usually in August or September), people become anxious, and then ask for water for monsoon dry crops. Sometimes the rain is heavy in the beginning, and the sowings are late, and these require artificial watering for bringing the crops to maturity. The following table gives the crops grown and the waterings required :—

TABLE I.

Name of Crop.	Nature (classification).	Number of Waterings required.	Time of year.	REMARKS.
Sugarcane	Perennial .	Every 8 or 10 days.	All the year round.	Maximum rotation 15 days in years of good rainfall.
Pán (betel)	" .	Every week .	" .	In cold weather if there is good dew less water required (grown in Nagar District).
Plantain .	" .	Fifteen days.	" .	Chiefly grown in Eastern and Central Khandesh.
Guava . .				
Lemon . .				
Kamod (rice).	" .	Ten days .	" .	Chiefly grown in West Khandesh and Upper Girna and Mosam Valleys.
Groundnut.	Eight months crops.	Every 15 days	Sown in July or August. Watering required only for first 4 or 5 months.	
Ehang . .	" .	" .	" .	Nagar especially.
Chilies . .	" .	" .	" .	
Onions . .	" .	" .	" .	

TABLE I—contd.

Name of Crop.	Nature (classification).	Number of Waterings required.	Time of year.	REMARKS.
Garlic .	Eight months crops.	Every 15 days	Sown in July or August. Watering required only for first 4 or 5 months.	Nagar special-ly.
Brinjals .	" .	" .	" .	
Wheat .	Rabi .	Four waterings. Two in very good years.	Sown in November and reaped in March.	(Jowári rabi crop in Nagar District.)
Gram .				
Juari .				
Carrots .	Monsoon dry.	One or two waterings according to the year. (In Jirayat land largely grown.)	Sown in July or August, reaped in autumn.	(Nagar District.) Largely in East Khandesh.
Maize .				
Bajri .				
Mag .				
Waral .				
Bala .				
Cotton .				

Distribution is controlled by the canal establishment on first class work. For every ten miles of canal and distributary (e.g., Jamda Canals in Khandesh) there is a Canal Inspector or Karkun, and under him, 1 Patkari and 1 Chaukidar for every four miles of main canal. The last mentioned watches the canal and maintains it and opens the sluices, and the Patkari distributes the water from tail to head of distributary in proper rotation. One measurer can measure about 1,000 acres. The revenue for all first class works is derived from direct crop rates. In second class works the area under the "channel" is permanently assessed as Bagayet, which includes water share and land assessment and are collected by the Revenue Department. In Khandesh these lands are called "Thals" sub-divided into "Phads" for practising rotation of crops (usually triennial and in a few cases quadrennial and quinquennial). They are all controlled and very economically managed by the irrigators of a village as a body, who have ancient and hereditary rights in the administration too lengthy to mention here.

Paragraph III.

I believe no tank has been constructed in the Bombay Presidency, with a high earthen dam cored with masonry wall. Black soil absorbs more water than others at first, but when once thoroughly soaked, it is fairly water-tight. I have personal experience of only two irrigation works in black cotton soil country, viz., the Jamda Canals and Mhaswa Tank in East Khandesh. The people grow chiefly cotton, which is very paying, with little trouble, and does not require any artificial watering in years of average rainfall. Only in years of prolonged drought they use canal water (late in the season as a rule) to bring the monsoon crops to maturity. The annexed Tables II and III will show how the irrigation fluctuates in good and bad years and also the protective value of the works and how the canal water is keenly resorted to in years of drought, such as 1900-1901. There is very little perennial irrigation under these works, partly because the people are not very rich, and they do not like to risk capital for high class irrigation, but prefer growing cotton. But latterly, I think, they have come to know the value of irrigation works and are keen about it, and they are likely to go in more in future for irrigated crops if water is available. In non-cotton growing parts, however, such as Pimpalner Taluka, Upper Girna and Mosam Valleys, where the people have been practising high class irrigation from time immemorial from uncertain bandhars, the owners of black soil lands are very anxious for storage tanks, and these works are very desirable and are likely to be more remunerative than in cotton-growing tracts such as East Khandesh. Ahmednagar is not a cotton-growing district and here high class irrigation is likely to flourish and is desirable. Although perennial irrigation under the existing works is very limited, but that is chiefly for want of sufficient water-supply. The people are very desirous of storage works and in black soil high class irrigation is likely to flourish.

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TABLE II.

Jamda Canals.

Nature of Rainfall.	Years.	RAINFALL.			ORDINARY KHARIF AND RABI CROPS.			Total Irrigation.	Total Revenue.
		Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.		
Good.	1892-93	42.91	1.16	44.07	641	1,500	2,141	2,271	4,177
	1878-79	38.37	0.87	39.24	22	750	772	814	3,372
	1875-76	37.06	0.98	38.04	56	248	304	354	1,826
	1886-87	28.14	8.25	36.39	58	1,009	1,067	1,333	3,668
	1883-84	30.02	6.30	36.32	251	1,622	1,873	2,083	4,544
	1887-88	25.48	6.78	32.21	142	910	1,052	1,336	3,267
Moderate.	1896-97	27.29	0.31	27.60	1,400	3,287	4,687	4,980	11,681
	1898-99	25.62	1.35	26.97	67	2,233	2,300	2,585	7,659
	1879-80	25.55	1.25	26.80	134	811	945	1,073	5,251
	1884-85	23.17	2.77	25.94	411	1,269	1,680	2,093	5,049
	1890-91	22.52	2.26	24.78	231	999	1,230	1,343	3,205
	1894-95	20.71	3.66	24.37	71	578	649	1,148	7,748
	1895-96	23.15	0.98	24.11	248	705	953	1,472	8,212
	1885-86	18.70	5.31	24.01	186	1,320	1,505	1,964	5,212
	1897-98	23.61	0.23	23.84	210	2,071	2,281	3,046	10,946
	1891-92	21.48	0.87	22.35	64	718	782	873	2,332
	1876-77	21.60	0.01	21.61	881	1,091	1,472	1,536	5,324
	1882-83	20.09	0.22	20.31	90	941	1,031	1,080	4,425
	1893-94	18.62	0.90	19.52	148	1,081	1,179	1,588	6,630
Bad.	1881-82	16.21	3.24	19.45	211	873	1,084	1,161	4,832
	1889-90	17.80	1.04	18.84	520	1,254	1,774	2,023	4,974
	1880-81	13.61	3.41	17.02	1,843	1,202	3,045	3,224	9,365
	1888-89	14.40	2.29	16.62	1,826	2,897	4,723	5,174	7,455
	1900-1901	16.30	0.00	16.30	1,123	2,465	3,538	3,757	7,264
	1877-78	14.45	1.82	16.27	1,919	2,923	4,842	4,925	14,634
	1899-1900	9.43	0.00	9.43	2,623	1,548	4,171	4,515	9,440

TABLE III.

Mhaswa Tank.

	RAINFALL INCHES.			AREA WHICH FLUCTUATES ON RAINFALL.			Total area irrigated.	Total Revenue.	REMARKS.
	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.			
Good years.									
1878-79	45.65	3.35	49.00	...	41	41	42	86	
1883-84	34.25	13.76	48.00	32	253	316	388	1,031	
1889-87	31.86	7.24	39.10	4	287	287	314	546	
Worst									
1899-1900	9.98	0.00	9.98	296	573	869	899	1,815	
Bad years.									
1881-82	14.47	2.29	16.77	...	49	49	139	706	
1889-89	15.10	2.14	17.24	64	466	529	576	657	

Paragraph IV.

The existing irrigation works in Nagar District are:—

1. Bhatodi Tank and Canal.
2. Ojhar Left Bank Canal.
3. Lakh Canal.

No. 1 is a storage tank of a capacity of 150 million cubic feet (much silted up lately). It generally fills as a rule, and only four times since its construction the replenishment was short by about 20 per cent. The irrigation has varied from 750 acres to a maximum of 1,720 acres during the last twenty years. On the whole the work has been fairly successful and the silt clearance is the only improvement desirable.

Nos. 2 and 3 are fed by the natural perennial discharge of the Pravara River. The irrigation under the Ojhar Canal has varied from 1,100 acres to 7,380 and that on the Lakh from 150 acres to 1,674 acres during the last ten years. The river supply is never equal to the demand, and in the case of the Lakh Canal especially, in bad years it runs dry about the end of February. The Ojhar is a

little better off, but the supply being uncertain, high class irrigation does not prosper, the perennial area varying from 145 to 265 acres. The people on this account do not venture to go in largely for high class irrigation under either work, and they only take water, when available, for light crops such "rabi" and "monsoon dry," but chiefly depend on the rainfall.

Particulars regarding completed and proposed works as per memorandum of Inspector-General of Irrigation are with the Superintending Engineer on special duty.

Besides the above existing works, storage reservoirs and canals have been proposed on the Mulla and Scena, the former when fully extended is likely to protect about 300 square miles of cultivable land. There is also the Godavari River project for irrigating Kopergaon and north of Nevasa talukas. The details are with the Executive Engineer, Nasik district. The above practically deals with all the important streams in Nagar district.

In Khandesh there is a very large scope for extension of irrigation. It is possible and is very desirable to construct a storage tank in each and every one of the great tributaries and sub-tributaries of the Tapi especially those under which bandhara irrigation is practised in a large scale, e.g., Panjhra, Kan, Musum, Girna, Bori, Burai, etc. Latterly a great many of these have been prospected and proposals made for storage tanks and canals, the detailed information of which has been collected by the staff of the Superintending Engineer on special duty and it is unnecessary for me to mention them here.

Paragraph V.

All irrigation works in Nagar district (and also in Khandesh) are "Imperial." I think it would be desirable that the Provincial Government should undertake the responsibility of the "Protective works," as it will give them a free scope to deal with such questions, and such works will be a great boon to the province as recent experience has proved. I do not, however, understand the system of "Provincial Contracts" and am therefore unable to say more on this point.

Paragraph VIII.

I do not know of any tract in Nagar and Khandesh districts where the land or crops have been injured by excess of water and water-logging. This is practically impossible, as the water-supply is by no means excessive and the people have to be given water by rotation as a rule.

PARAGRAPH IX.

TABLE IV.

List of Famine Works executed during 1901-02 in Ahmednagar District.

No	Classification.	Names of Works.	Expenditure during 1901-02 to end of September 1901.	Total Expenditure to end of September (i.e., including last year's Expenditure).	REMARKS.
		<i>Provincial.</i>	Rs.	Rs.	
1	Roads . . .	Improvements to the Ahmednagar Paithan road.	5,992	5,992	
2	Do. . . .	Improvements to the Ahmednagar-Malegaon road, Section I, from Rahuri to Kolhar, i.e., miles 26 to 34.	14,360	49,829	
3	Do. . . .	Improvements to the Ahmednagar-Malegaon road (from the Seena river up to 3 miles north of Rahuri), Section I, from miles 5 to 26.	62,019	62,019	
4	Do. . . .	Improvements to the Ahmednagar-Malegaon road, Section II.	7,135	7,135	
		<i>Incorporated Local.</i>			
5	Do. . . .	Improvements to the Rahuri Station feeder road.	654	654	
6	Do. . . .	Constructing Kharda-Jategaon road . . .	113	1,32,465	
7	Do. . . .	Constructing Kopargaon-Puntamba road . .	2,43,603	2,43,603	
8	Do. . . .	Improvements to the Shendi-Wambori road .	49,553	49,553	
9	Do. . . .	Improvements to Sheogaon-Bodhegaon road .	8,807	8,807	
10	Do. . . .	Constructing Jamkhed-Kharda road . . .	...	20,164	
11	Do. . . .	Constructing Mahi-Jalgaon road to Sholapur Frontier.	7,403	1,64,543	
12	Do. . . .	Constructing 1st Section of the Visapur feeder road.	1,147	1,83,151	
13	Do. . . .	Extension of the Visapur feeder road to join the Supa-Parner road.	29,889	29,889	
14	Do. . . .	Constructing Pathardi-Moho road, Section I, from Pathardi to Chinchpur Zda.	23,212	1,80,058	
15	Do. . . .	Constructing Jamkhed-Karmala road up to Sholapur Frontier.	61,381	1,10,124	
16	Do. . . .	Extension of the Newasa-Sheogaon-Bodhegaon road up to Moglia Frontier near Sukli.	2,311	98,385	
		<i>Provincial.</i>			
1	Metalling .	Collecting and breaking metal on the Ahmednagar-Poona road section from Ahmednagar to Ghod river.	..	1,13,153	
2	Do. . . .	Collecting and breaking metal on the Ahmednagar-Paithan road.	56	2,77,553	Completed.
3	Do. . . .	Collecting and breaking metal on the Ahmednagar-Malegaon road, Section II.	2,164	5,48,034	Completed.
		<i>Incorporated Local.</i>			
4	Do. . . .	Collecting and breaking metal and improvements to the Kolhar Bari road from miles 51 to 66.	1,17,373	1,98,394	
5	Do. . . .	Collecting and breaking metal on the Kopargaon-Singanapur road.	1,294	29,233	Completed.
6	Do. . . .	Collecting and breaking metal on the Ahmednagar-Sheogaon road.	8	2,33,398	Do.
7	Do. . . .	Collecting metal on the Newasa Belapur road. .	117	2,51,217	Do.
8	Do. . . .	Collecting metal on the Shendi-Wambori road. .	64	39,911	Do.
9	Do. . . .	Collecting metal on the Rahata-Chitali road. .	15	1,02,658	Do.
10	Do. . . .	Collecting metal on the Newasa-Sheogaon-Bodhegaon road.	...	4,22,386	Do.
11	Do. . . .	Collecting metal on Khosपुरi-Ismaipur road. .	...	93,132	Do.
12	Do. . . .	Collecting metal on the Nagar-Ahua Ghat road.	63	30,171	
		<i>Imperial Military.</i>			
1	Irrigation works	Reservoir at Kapurvadi in connection with the water-supply to the town of Ahmednagar.	87,826	5,27,674	Do.
		<i>Imperial Irrigation.</i>			
2	Do. . . .	Silt clearance, Lakh Canal	9,468	56,097	Do.
3	Do. . . .	Silt clearance, Ojhar Left Bank Canal at Nala No. 28 in mile 16.	23	60,117	Do.
4	Do. . . .	Constructing Ojhar Right Bank (including Muslwadi tank).	2,52,581	10,56,663	
5	{ Do. . . .	Constructing Visapur Tank	2,20,359	8,18,373	
	{ Do. . . .	Constructing Visapur Canal	7,187	7,187	

Mr. L. M. Bose. The following Irrigation works in Nagar District were left uncompleted, and it is very desirable that they should be speedily finished as "Protective works Imperial":—

- 19 Dec. 01. 1. Visapur Tank (still in progress);
2. Maladevi Tank (work carried out by Executive Engineer, Nasik district);
3. Ojhar Right Bank Canal; and
4. Musalwadi Tank (in progress).

No. 1 will introduce irrigation in Shrigonda Taluka, which always suffers from drought. In the beginning, the work will probably only just pay its working expenses but later on irrigation is expected to develop and the work may pay as much as 2 per cent. on direct capital, but the indirect profit will be very great, as it will protect about 50 square miles of Shrigonda taluka from famine in bad years.

Nos. 2 to 4.—In conjunction with the existing Lakh and Ojhar Left Bank Canal from the Pravara River Irrigation scheme. The existing two works being dependent only on the river discharge, invariably run short of water and consequently high class irrigation cannot prosper as already described in paragraph 4. The storage tank will be a great stimulus to the existing irrigation which will develop rapidly and moreover fresh areas will be brought under the new works. It is anticipated that about 200 square miles of the Pravara valley will be protected from famine and the works will be a great boon to the people and is likely to bring in some profit to Government after paying working expenses.

There have been no village tanks or other Irrigation works completed during the recent famine in Nagar district.

Paragraph XIII.

Scale of water rates in Nagar District are:—

	Rs.
Perennial from	8 to 12
Eight months crops from	4
Rabi crops	2 to 3
Monsoon dry	0-8-0 to 1-0-0
Special hot weather	4

In Khandesh the rates are:—

	Rs.
Perennial from	10 to 16
Eight months	4 to 8
Four „	2 to 5
Monsoon dry	1 to 2
Special hot weather	4 to 8

In all first class works water applications are received once a year for perennial and by season for the other crops. The distribution is controlled by the Canal Establishment as described in paragraph 2.

Lines 4 and 5 answered in paragraph 5.

The attached Table VI gives the balance of tank water at the end of irrigation season (31st March) for the Bhatodi Tank in Ahmednagar district from 1887—1901 and for a few typical years for three tanks in Khandesh district. In ordinary years, if the tank fills, there is generally a balance at the end of the year. The only other sources of revenue besides water rates consist of realization from sales of babul wood, thorns, hemp plant, grass, and also rent from leasing dry portions of tank bed, but these constitute small proportion of the revenue. The charges of maintenance and establishment in irrigation works in the Deccan are certainly not fair. They are often out of all proportion to the revenue realised, e.g., Lakh Canal in Nagar district. The revenue in the year 1897-98 was Rs. 1,409 and the Establishment charges were 29,955 and area irrigated 950 acres. The revenue accounts of these works are therefore by no means indicative of the actual financial results of the work. They are practically eclipsed by the excessively heavy Civil Establishment charges, as the areas irrigated are comparatively small.



TABLE VI.
Balance in Tank at the end of Irrigating Season.
(In million cubic feet.)

	1887-88.	1888-89.	1889-90.	1890-91.	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	1900-1901.	REMARKS.
<i>Nagar District.</i>															
Bhatodi Tank	116.26	39.33	65.19	45.56	0.54	63.99	34.73	7.16	29.89	...	4.46	6.53	...	...	Full capacity, 150 million cubic feet.
<i>Khandesh.</i>															
	(1882-83)														
Mhaswa Tank	Nil	...	Nil	...	...	...	69.10	...	13.53	65.18	...	...	...	Nil	Full capacity, 160 million cubic feet.
	(1882-83)	(1883-84)	(1884-85)	(1888-89)	(1889-90)										
Mukti Tank	46.95	170.11	228.30	245.21	48.75	...	...	...	...	...	124.10	193.58	176.19	62	Full capacity, 342.
					(1891-92)	(1892-93)		(1894-95)	(1895-96)		(1897-98)			(1900-1901)	
Persul Tank	17.95	14.80	...	13.66	41.87	...	Nil	Nil	Full capacity, 119.

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Paragraph XIV.

The protective value of irrigation works in the Deccan has been immense since the year 1897. From the following table of works in Nagar district and the Jamda Canals (a typical work in Khandesh) will show that the canal water was fully utilized for irrigating crops :—

	Ojhar Canal.	Lakh Canal.	Bhatodi Tank.	Jamda Canal (Khandesh).
	Acres.	Acres.	Acres.	Acres.
1896-97 . . .	4,890	1,674	1,386	4,980
1897-98 . . .	6,068	950	1,400	3,046
1898-99 . . .	5,472	970	743	2,585
1899-1900 . . .	3,701	1,053	870	4,515
1900-1901 . . .	7,380	982	1,309	...

11.

A.—GENERAL.

1. Ahmednagar and Khandesh Districts. I was in Khandesh for about 5 years at first as Assistant Engineer and latterly as Executive Engineer for Irrigation. In Nagar I have been for the last four months. I was also under the Superintending Engineer on special duty for two months.

2. List of rainfall :—

List of average rainfall month by month on Irrigation Works in Ahmednagar District.

Months.	Bhatodi (Ehatodi Tank). Average of 24 years.	Ashni (Ojhar Canal). Average of 24 years.	Malunja (Lakh Canal). Average of 31 years.
January . . .	0.04	0.14	0.42
February . . .	0.17	0.09	0.12
March . . .	0.12	0.07	0.06
April . . .	0.18	0.13	0.13
May . . .	0.80	0.90	0.91
June . . .	5.57	4.78	4.95
July . . .	3.54	3.52	3.10
August . . .	3.49	2.54	3.18
September . . .	6.92	6.88	5.72
October . . .	2.90	3.49	3.01
November . . .	0.93	0.61	0.59
December . . .	0.50	0.40	0.32

3. (1) There is no obstacle to extension of irrigation in either district, for "sparsity of population."

(2) In irrigated areas, the supply of cattle is generally sufficient, but during the recent famines the mortality of cattle has been heavy and is therefore likely to affect for some time the new tracts where irrigation projects are proposed.

(3) The supply of manure was noticed to be insufficient under the Jamda Canals in East Khandesh. In Nagar district, the irrigation villages have sufficient manure.

(4) No unsuitable soil in Nagar district. In East Khandesh the soil is mostly *black cotton*, the result being that the irrigation does not flourish so well under the Jamda Canals and Mhaswa Tank.

(5) Uncertainty of supply of water and its too early cessation have been the chief obstacles for extension of irrigation in both the districts.

(6) Under the Jamda Canals and the Ojhar Left Bank Canal, lack of capital has been to a certain extent the cause of non-development of high class irrigation.

(7) No.

6. I know of no instance where cultivation in Jirayat land has been deserted for irrigation tracts. I have noticed the people everywhere very anxious to have water-supply increased and ensured in order that they extend irrigation. I have noticed this particularly in Pimpalner taluka and Girna and Mosam valleys, where the agriculture is chiefly dependent on old irrigation channels and bandharas.

During the famines of 1896-97 and 1899-1900, the works of flood embankment and silt clearance were opened as relief works on the Jamda Canals in Khandesh, but the workers chiefly came from the neighbouring villages and only a handful of the labouring classes came from the irrigation villages and none of the agricultural class came from the latter places. The Kunbis of these protected villages managed to raise a crop anyhow and had enough to live on, whereas the neighbouring villages were starving. Similarly on the Bhatodi silt clearance work in Nagar district in 1898, the irrigation villages sent only about 10 per cent. of the population compared to a neighbouring "dry" village which sent 25 per cent. of its population to the relief work.

B.—CANALS OF CONTINUOUS FLOW.

7. (1) Two crops and sometimes three crops are grown in one year if there is sufficient water and manure.

(2) Yes. More valuable crops are grown if the people are keen and have enough capital and manure and water.

(3) (a) and (b) Yes. (c) If the water supply is ample.

9. In all first class canals in the two districts, water rates are charged on the *actual area irrigated*, and the owner of the land is the person who is responsible for the payment of assessment to Government. In Khandesh under the second class works a consolidated rate is settled by the Revenue Survey Department which includes the lands assessment as well as the water rate for the whole area under command of the channel known as the "Thal," irrespective of the area actually irrigated. In Nagar there are no second class channels of continuous flow.

The average crop rate on the Ojhar and Lakh Canals (Nagar District) is Rs. 3-12-0 per acre.

In Khandesh on the Jamda Canals the average rate is Rs. 5-6-5 per acre. All three *first class works*.

The "Thal" rate for second class works vary from Rs. 2 to Rs. 15 in Khandesh.

10. It generally costs the irrigators about Rs. 2 to Rs. 5 for making channels from the "distributary" or "canal" for bringing water into his field. This is generally borne by the owner of the land.

11. The evils mentioned in the three lines do not exist on any of the works that I have come across. Rotation system is generally adopted, which prevents waste of water and water-logging.

20. In first class works the maintenance charges including small repairs, silt clearance, etc., are carried out by Government and the charges vary from Rs. 2 to Rs. 3 per acre. In second class works the villagers generally do it, unless owing to circumstances beyond their control such as exceptional floods etc., the work is too costly or difficult for them to carry out and in such cases Government carry out the work from "Imperial Funds." This system is not very satisfactory. In several instances villagers have neglected the channels and let silt accumulate and then they apply to Government for doing this work as being "beyond their power to do." I think some legislation is necessary to define the responsibilities of the villagers on second class works. Certain rules have recently been framed by the Commissioner, Central Division, but they have never been observed. *Legislation is necessary.*

D.—TANKS.

23. (1) All the tanks in Nagar and Khandesh districts are supplied by the annual rainfall on their catchments.

(2) By a direct canal from the tank in the case of Bhatodi (Nagar) and Mhaswa (Khandesh). The Mukty and Parsul tanks in Khandesh feed old second class bandharas from which water is delivered to the lands by "channels."

(3) The supply is maintained in all the above cases—

(a) Throughout the year.

(b) About 9 months.

(c) Up to December or January.

24. (1) Too late replenishment generally affects sowing of monsoon and eight months crops; the balance that is usually left from previous year is generally utilized economically for perennial crops and cannot be spared for other crops.

(2) Too early cessation affects the perennial crops especially and unless well water is used they are liable to perish. As a rule, however, all fields with perennial crops have got wells.

26. Not in ordinary years. Each perennial field as a rule has a well (in Nagar no application is granted for perennial, unless there is a well in the field). In bad years well water has to supplement the canal water, especially for high class crops, and only half the usual rate is charged in such cases.

28. Bhatodi Tank (Nagar) average rate Rs. 4-12-9 per acre actually irrigated.

In Khandesh average of four tanks is Rs. 5-5-9 per acre per area actually irrigated.

Under Mukti tank in Khandesh (Lower Panjra River works) a double system prevails. The "Thal" areas under the command of the second class channels that existed before the construction of the tank are still charged consolidated "Thal rate" irrespective of area irrigated (rate averaging from Rs. 10 to Rs. 18). The fresh lands besides the above that received tank water are charged first class crop rates.

29. Same as paragraph 10.

30. By Government, except on the Lower Panjra works, where the villagers look after the channels. Same remark as in Question 20. Legislation is especially desirable for such works as recently (in 1899). There was a good deal of trouble about the distribution of water between Thal and "Jirayat lands."

33. The Bhatodi Tank storage has been considerably reduced (by about 50 per cent.) since its construction (30 years ago), owing to accumulation of silt. The quantity of silt accumulated in these years is about 73.4 million cubic feet, i.e., at the rate of 2.44 million cubic feet per year, from a catchment of 44 square miles. No dredging has been resorted to. The work of removing silt by excavation was done as a relief work in the year 1898-99 in the hot weather, when the tank was empty.

E.—WELLS.

34. (1) The depth of permanent wells varies from 20 to as much as 60 feet. The water surface varies from 13

to 30 feet from ground level, and depth of water from 5 to 13 feet. *Mr. L. M. Bose.*

(2) Generally from sub-soil percolation, especially those in irrigated tracts and below tanks. In the hilly parts wells are generally fed by springs. 19 Dec. 01.

(a) They do not fail in ordinary years as a rule.

(b) Generally fail; especially those fed by springs.

(3) Pakka wells cost from Rs. 150 to Rs. 600; Kachcha wells from Rs. 75 to Rs. 100.

(5) Water is usually raised by "Mots" or leather bags drawn by one or two pairs of bullocks. The number of "Mots" vary from 1 to 4 according to the size of the well.

(7) The average area irrigated by a well varies from 2 to 8 acres in one year.

35. (1) Yes, partly.

(2) Generally vegetables, chillies, onions, sweet-potatoes, etc. Sugarcane is rarely grown from wells.

(3) (a) Yes.

(b) They generally grow food-grain and fodder in bad years. Sweet-potatoes were very largely grown during the last famine in Khandesh as they afforded good nourishment to the famished.

38. In Nagar district recently some experiments were made with boring apparatus with success. I think this should be encouraged, and it would be advisable for Government or local bodies to invest in a number of boring tools and let them out on hire to cultivators, at reasonable rates, and also professional assistance should be given where needed.

39. Government cannot very well undertake to construct wells in private lands, but they might assist by giving professional advice and supervision *free of charge* and also by giving tagai advances and seeing that they are made proper use of.

40. Kachcha wells are commonly resorted to in years of drought but unless they are dug in places where water is expected to be met with, such as in tracts below some tank or canal, or near banks of streams, they are invariably unsuccessful. In 1899, in Khandesh, these wells held water only for a short time, and as the season advanced 50 per cent. of them dried up.

1. Q. (*The President*)—The district you know best is Khandesh?—Yes.

2. Q. You were there for 5 years?—About that; I was there from 1896. Before 1896, I was at Ahmednagar for 3 years as Assistant Engineer.

3. Q. You say there is no soil in the Ahmednagar district unsuitable for irrigation. Do the people irrigate all kinds of soil?—I think so; especially in Ahmednagar. The black soil there is not of the same kind as in the East Khandesh which is deep black cotton soil. In the Ahmednagar district the black soil is not so deep, has more clay in it and is suitable for the irrigation of high class crops.

4. Q. Have you known cases of irrigation of rabi crops in Khandesh?—Yes; I have seen wheat and gram irrigated under the Jamda canals.

5. Q. How long does the canal keep running?—In 1900 about December the water-supply was very low; in February the canal was quite dry.

6. Q. Wheat is sown under this canal?—In 1899 they went in largely for *bajri* and cotton crops.

7. Q. When is *bajri* matured?—In September.

8. Q. Is that a *kharif* crop?—Yes.

9. Q. When is the *rabi* crop sown?—In December and January.

10. Q. The canals, which run full up to December, give quite sufficient water for the *rabi* crop?—Yes; as a rule. Very large areas were irrigated in 1896. That was about the maximum under the Jamda canals. 1896 was not a bad year, although there was distress; we had splendid rain in the beginning of the season. In the year 1899 the case was quite different. The rainfall was deficient.

11. Q. I notice that in 1899-1900, 4,515 acres were irrigated under the Jamda canals?—Yes; that was a very satisfactory area compared with other years.

12. Q. Was the canal dry in December?—It was not quite dry, but it was not working at anything like its full capacity.

13. Q. You have a tank and two canals in your district. Have they their own catchment basins?—Yes.

14. Q. From local rainfall?—The Bhatodi in Ahmednagar and the Mhaswa in Khandesh are fed from their own catchments by streams in the ghats.

15. Q. What is the Mukti?—It is a tank fed by its own catchment. It feeds a number of *bandharas* below.

16. Q. No canal feeds it?—No.

17. Q. Is it a tail tank?—We have no tail tank in Khandesh at present.

18. Q. Throughout Khandesh is there a great number of old village tanks?—There is a large number in the Nasik portion of the Irrigation charge.

19. Q. None in Ahmednagar?—Very few.

20. Q. Are the tanks in Khandesh and Nasik generally in good order?—Most of them have just been repaired. During the floods of 1877 and 1896 a great number of the bunds burst. I know one bund particularly near Dhulia that burst in 1896.

21. Q. (*Mr. Ibbetson*)—In 1896?—Yes; in the last famine.

22. Q. (*The President*)—Do the people show any desire to have these bunds repaired?—Yes.

23. Q. Do they never do that themselves?—No; the work is too heavy and too expensive for them.

24. Q. Do the Public Works Department do anything?—No; the Irrigation Department generally repair them.

25. Q. Have you been employed in repairing any?—Yes, I sent up estimates for the Bhokar Tank which was going to

Mr. L. M. Bose. be taken up as famine work, but sanction did not come in time, and it was not taken up.

19 Dec. 01. 26. Q. Was the Parnapura tank substituted for it?—No.

27. Q. Is that a local tank?—No; it is a very big irrigation tank.

28. Q. Apart from famine relief does the Public Works Department not repair these tanks from time to time?—Yes, the Public Works Department repair certain tanks, but the people have to make a 10 per cent. contribution.

29. Q. They apply to the District Engineer?—No; to the Irrigation Engineer. A reference is made to the Revenue authorities as to whether it is worth while doing the repairs, whether there would be any appreciable increase of irrigation, and also whether the rayats are willing to pay assessment in case the tank is repaired. Generally a consolidated rate is charged.

30. Q. Are there any places where there are chains of tanks following each other down the same stream?—No; we have proposed one on the Panjra, but it has not been taken up.

31. Q. Are the people keen on irrigation in ordinary times and do they make applications for irrigation works, or do they only want irrigation in times of drought?—In East Khandesh they are not very keen.

32. Q. In the east I suppose cotton grows easily without irrigation?—Yes, cotton grows very easily; it requires very little trouble and expense; and so they go in largely for cotton. The case is quite different in Central Khandesh and in the west along the upper valley of the Panjra. North of the Tapti the people like irrigation. A channel in the Shahada taluka was repaired during the year 1896-97, which irrigated, I think, something like 500 or 1,000 acres. Similar channels might be made north of the Tapti where the people don't grow so much cotton. They go in more for rabi, wheat and gram. I have also noticed that the streams north of the Tapti, near the foot of the Satpuras, are mostly perennial.

33. Q. Is the rainfall along the right bank of the Tapti heavier throughout Khandesh generally?—The Satpuras get a very good rainfall.

34. Q. Do you think favourably of them?—I think Karvand is a very good tank; it will not be so expensive as the Amner tank, which is very costly. I doubt whether it will pay, as Government will have to invest a large amount of capital in it.

35. Q. Do you think the land below the Kaivand tank will take irrigation?—Yes.

36. Q. What other tanks you have been engaged upon?—Chankapur, Markundi and others.

37. Q. Which of these do you think the best?—The Chankapur tank is the best, because it will be a productive work. People in the upper reaches of the Girna have been used to irrigation from time immemorial, but latterly owing to the destruction of forests the river supply has become very poor.

38. Q. The catchment basin is 100 square miles?—Yes.

39. Q. (Mr. Muir-Mackenzie)—Has the destruction of forests taken place recently?—Not in my time; it was done 50 or 60 years ago. The villagers in the upper reaches of the Girna used to practise irrigation from old channels, but now they have discontinued doing so because the water supply is not sufficient, which shows that the river supply was sufficient at one time, but it is not so now.

40. Q. What time do you refer to?—About the last 30 or 40 years.

41. Q. Do cultivators say that?—Yes.

42. Q. Do they attribute it to the destruction of the forests?—They say that they cannot tell what the real cause is; but that might be one of the reasons.

43. Q. (The President)—When you refer to the system of repairs of second class works, you mean *bandharas*?—Yes.

44. Q. You say "in several instances villagers have neglected the channels and let silt accumulate and then they apply to Government for doing this work as being beyond their power to do." What are these channels? What would you like to do?—I was referring specially to the Mukti tank, where I had trouble in 1900. The land is partly under a kind of *bagayet* and partly under the crop system. The water in the tank was very little; not even one-third, and we had to introduce a system of

rotation, but the villagers began to intercept water in the upper reaches and we could not control them.

45. Q. I suppose you were working in conjunction with the Collector?—Yes; I refer to certain instances in which I came upon villagers who intercepted the water and wasted it: I called the Collector's attention to it and proposed a penal rate, but he said we could not interfere in cases in which permanent *bagayet* was paid. I recommended that the offenders should be prosecuted for mischief. Some sort of legislation is, I think, necessary to keep water more under the control of the Irrigation Department. I also think legislation is necessary to make the people clear the silt. Formerly contributions used to be made by the villagers, and the Irrigation Department used to clear the silt from the channels. I think Government abolished that system, because it was considered illegal. The villagers have to do the ordinary silt clearance, and when the channel is very much silted up under circumstances beyond their control, such as from heavy floods, etc., the Irrigation Department takes the work up. It is very difficult to define where the villagers' responsibility commences and where it ends.

46. Q. You contend that it would be far better if the Irrigation Department did the thing always?—I think not, because it would cost Government much more than it does at present. The villagers would be sure to neglect their channels. I think the *Patfalla* system was the best. It was preferable to the present one.

47. Q. (Mr. Ibbetson)—Do you know why it was abolished?—The High Court, I believe, decided that it was an illegal contribution.

48. Q. It could be made legal by passing a law?—Yes; I think it is very desirable that some sort of legislation should be passed.

49. Q. (Mr. Higham)—You were in charge of the Purma-pada tank when it was being built as a famine relief work?—Yes, I surveyed it, designed it and carried it out.

50. Q. When was the work stopped there?—About last January.

51. Q. What is the system?—This tank is in place of one that was originally proposed, higher up the river. I was put on drawing up the project in 1896.

52. Q. What is the state of the tank?—The side embankments are nearly completed. The gorge portion remains to be done as also the waste weir.

53. Q. The dam is made of earth?—Yes, entirely.

54. Q. How many labourers were employed on it?—About 15,000.

55. Q. What percentage of work remains to be done?—I should think about one-third has been done.

56. Q. How long were the 15,000 people employed on it?—About eight months; the work was started late; there was some considerable delay in getting sanction.

57. Q. Do you know what famine expenditure was incurred?—I could not say exactly. I think it was a couple of lakhs.

58. Q. Could you not have employed more men on work than you did?—No.

59. Q. Supposing you had had 15,000 ordinary labourers on the work would you have finished the work?—I do not know whether we would be able to get so much labour in ordinary years; about 10,000 labourers would be quite sufficient to finish it in one season.

60. Q. As a matter of fact you had 15,000?—They were famine labourers; but they did a fair amount of task.

61. Q. What proportion does total payment to the labourers bear to the actual value of work done by them?—About 80 per cent. I do not know the exact figures.

62. Q. Have you seen the statement prepared by Mr. Beale?—Yes.

63. Q. Do you accept them?—I think by making a part of the *dam* of masonry we could store a little more water. I think it is too late now; we could have made the right bank of masonry; I had proposed at first that we should store at least 100 millions cubic feet, but it was objected to.

64. Q. How could you store the water?—By putting automatic gates they would have irrigated a larger area of land.

65. Q. Do you call Mr. Beale's estimate fair?—Yes, it is very fair.

66. Q. Did you make any estimates?—Yes; these are practically my figures.

67. Q. No complete estimate has ever been submitted?—Only a famine estimate.

68. Q. What about the complete project?—I think Mr. Gahagan is preparing it.

69. Q. You did not prepare one?—No.

70. Q. The only estimate you prepared was an estimate for relief works?—Yes.

71. Q. If the tank is made, it will supply a number of *bandharas* below it?—No, only two.

72. Q. Is there room for the extension of irrigation?—There is plenty of scope for that.

73. Q. Would you make new *bandharas*?—Two new canals are proposed.

74. Q. The canals would be below the *bandharas*?—The *bandharas* are below the canals.

75. Q. You have to pass water down to the *bandharas*?—Yes.

76. Q. You would have no trouble?—No, there would be no trouble, because it will be a first class work.

77. Q. There would be no necessity to impose a water rate?—No, except for the fresh land that comes under irrigation.

78. Q. Would any fresh land be brought under irrigation?—Yes, I think so, especially below Amalner, where the people are keen to irrigate. They are very well off.

79. Q. You would extend irrigation on *bandharas*?—I think it would be more profitable to extend the present Amalner channel than to make a new canal.

80. Q. A great portion of the soil in the Nasik district is not black soil?—No; about one-fourth is black soil.

81. Q. The rest is red?—Red and white murum.

82. Q. What is the depth of the red soil?—About 5 to 6 feet.

83. Q. It is not a rich soil?—No.

84. Q. What crop can be grown on it?—Very good ground-nuts.

85. Q. What about sugarcane?—Black soil is very good for sugarcane.

86. Q. What about red soil?—With plenty of manure, sugarcane might be grown upon it.

87. Q. If you want sugarcane, you have to put down plenty of manure?—Yes.

88. Q. For other crops?—No.

89. Q. (Mr. Muir Mackenzie.) Ground-nut?—I don't think that crop requires much manure.

90. Q. For the *bandharas* you have to repair in Nasik and Khandesh, you take 10 per cent. from the people?—No; they don't have to contribute anything.

91. Q. You say sugarcane only requires watering for 15 days?—That is the maximum interval between waterings; it takes only 8 or 10 days ordinarily.

92. Q. The interval depends upon the depth of the soil?—Yes.

93. Q. If you give heavy waterings, do they go further?—I think so.

94. Q. With regard to the distribution of the canal supply in Nasik, does your establishment control the distribution inside the water-course as well as the Government canal?—No, not on second class works. Of first class works we shut up the sluices, which, however, the villagers can easily open.

95. Q. What is done on the Jamda canal?—That is a different work altogether; there is no *bandhara* system there.

96. Q. You have the canal and the water-courses?—Yes, and the distributaries.

97. Q. Do you control the supply of each water-course?—Yes.

98. Q. You shut up one and open another?—Yes.

99. Q. Do you control the water after it leaves the water-course?—No; the villagers distribute it among themselves.

100. Q. The canal establishment does not interfere?—No.

101. Q. How do you manage the tail of the water-course?—The fields at the tail are generally given water first.

102. Q. Who gives them the water?—The Patkaris who look after them; the villagers, as a rule, agree among themselves about the distribution.

103. Q. Your experience of irrigation works generally is that the areas fall off in wet years?—Yes.

104. Q. In bad years you get very large areas?—Yes; specially for monsoon and rabi crops.

105. Q. The worse the rainfall, the larger the area irrigated?—Yes.

106. Q. You do not irrigate more in a bad year now than you used to?—Latterly, I think, there has been a tendency to extend irrigation under canals in good years. The people are more keen than they used to be.

107. Q. Do you think the people have begun to care less about fluctuations in the rainfall?—Yes; but there is one great drawback, that is the uncertainty of the river supply. A storage tank for the Jamda canals would be a great boon.

108. Q. Would they take water in a wet year?—Yes, I think they would go in for more sugarcane.

109. Q. (Mr. Rajaratna Mudaliyar. In Khandesh, you say there has been scarcity of water-supply; has the area decreased to some extent?—I know in some villages the area is one-third of the original area. As a rule, I think, there is a decrease of 30 per cent. even in good years.

110. Q. That, I suppose, is due solely to the deficient rainfall?—Yes.

111. Q. Is there no deterioration under the channels?—In some cases the channels and *bandharas* are silted up. The chief want is that of musam storage reservoirs; on the Girna, Burrai, and Panjra valleys irrigation would have flourished copiously had there been plenty of water.

112. Q. You say, "In Khandesh there is a large number of small village tanks that used to irrigate a few acres of land." Have you any idea of the extent of land irrigated?—I don't think it ever exceeds 5 acres.

113. Q. What is the total area irrigated?—I have not got the figures.

114. Q. Can you think of any arrangement by which the system of application for canal water could be dispensed with?—The only arrangement that could be made is to place the whole irrigable area under permanent *bagayet* like the land under second class *bandharas*. I suggested to Government a few years ago to place at least a part of the area under the Jamda canals under permanent *bagayet*. That proposal was, however, not accepted chiefly on account of the short water-supply.

115. Q. You say people have to wait a long time for replies to their applications?—I think a great deal of delay can be avoided if a Sub-Divisional Officer is empowered to grant water applications instead of the Executive Engineer.

116. Q. Are you aware that in Sindh no application is required at all?—In Sindh there is a permanent assessment. We have not tried that in this Presidency. At present there is a lot of delay in granting water applications which deters the cultivators from asking for water.

117. Q. (Mr. Muir-Mackenzie.) A Patel on the Jamda canals said that some cultivators owning about 250 acres of land had expressed their willingness to accept a permanent assessment. That is the Bahal village; I think it should not be introduced on the whole of the Jamda canal unless we can ensure a water-supply by the storage tank that is proposed.

118. Q. If the supply could be assured, do you think a permanent assessment would be acceptable to the people?—Yes.

119. Q. Would it be advantageous to the people?—Yes, there would be more inclination to extend the irrigation of high class crops so that they could get more profit.

120. Q. Are you aware that on the *bandhara* system in fixing permanent rate the precariousness of supply is taken into consideration?—Not everywhere, I am afraid. On the lower Panjra, where we have got a storage tank, the rate is fair enough, but on other works like the one near Thengoda they have got a very small Thal, and the assessment is Rs. 14, the water-supply being far from perennial. In many cases the assessment is not fair.

121. Q. Do you mean that the capacity of the *bandhara* has been imperfectly calculated?—I think that is so in many cases, but in some cases it is all right. As for example at Baze Rs. 15 per acre is charged, but they have a small perennial supply, as it is just below the proposed Chankapur tank; people have grown rich there owing to the rich quality of the soil.

Mr. L. M.
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122. Q. You would lower the rate on the Jamda?—I should recommend that it be lowered to Rs. 5 per acre.

123. Q. You think that would allow for fluctuations?—Yes.

124. Q. (Mr. Rajaratna Mudaliyar.) As regards the Visapur tank, I find that about Rs. 8,00,000 have already been spent; what amount would be required to complete the work?—I could not say exactly; the estimated amount is Rs. 14,00,000. I do not know what the normal expenditure would be; about one-sixth of the embankment has been done.

125. Q. Five-sixths remains to be done?—Yes.

126. Q. Do you think that when the work is completed, the supply will be sufficient to reach the waste weir?—Not every year.

127. Q. In normal years?—No. I think Mr. Beale has calculated that it will fill in 16 years out of every 27 years. I am certain it won't fill every year.

128. Q. You say that when the work is completed, it will irrigate an area of 50 square miles?—It won't irrigate 50 square miles; that is the area commanded; the area irrigated will be about 8,000 acres.

129. Q. Only 8,000?—Yes, about that; in a bad year it might be a little more.

130. Q. (The President.) You say the land submerged under tank is worth Rs. 45 per acre?—Yes; the land is not good; most of it is waste land.

131. Q. In Ahmednagar there are only two second class works?—Yes; they are looked after by the Public Works Department.

132. Q. The average annual expenditure for the last ten years on these is Rs. 2,440; the gross revenue Rs. 535. Can you explain why the expenditure is five times the gross revenue?—The expenditure must have been incurred in putting the channels in order and repairing the *bandharas*; it is not a recurring expenditure; it is an initial expenditure.

133. Q. The amount shown under improvements is only an average of the past ten years?—Yes.

134. Q. In your first note you say, "In bad years well water has to supplement the canal water especially for high class crops." Is that invariably the case?—Yes; in the Ahmednagar district no water application is allowed for sugarcane or other perennial crops, unless the owner has a well in his field.

135. Q. For what period do you supply canal water?—This year water won't last for more than another fortnight; the canal is already nearly empty.

136. Q. For what period do they use well water?—It will be for more than half the period this year, so only half the assessment will be charged.

137. Q. Even supposing you have canal water enough only to last for a fortnight, what do you do?—We generally

serve the perennial crops as much as we can in preference to other crops.

138. Q. Do you know anything about the Bhatodi tank?—Yes.

139. Q. The average revenue is Rs. 4-12-9 per acre actually irrigated, and the working expenses exceed the revenue?—The working expenses include "establishment charges"; I do not know that really represents the actual cost of management.

140. Q. What proportion of establishment charges is included?—It is a very complicated and elaborate system.

141. Q. The establishment charges are out of all proportion to the revenue derived?—Yes.

142. Q. (Mr. Higham.) Are there any provincial works in progress?—Very few.

143. Q. The establishment charges have nothing to do with them?—No, they are Local Fund works.

144. Q. Do you charge to the Local Funds a certain percentage?—Yes, 12 per cent.

145. Q. The establishment charges are exaggerated figures?—Yes, always. In Khandesh the establishment charges are heavy because the number of works of the first class is very small. The charges under the Jamda Canal are very heavy, because the district has not got many first class irrigation works.

146. Q. Do the Jamda canals yield a good revenue?—Yes, but the number of high class works in progress is very small and the establishment charges are consequently large.

147. Q. There is no debit for establishment in regard to second class works?—No.

148. Q. It is debited to the first class works only?—Yes.

149. Q. These charges in Ahmednagar are exceptionally high?—Yes.

150. Q. What happened in the case of a Provincial Division like Sholapur?—The charges would not be so heavy.

151. Q. Only 28 per cent. would be charged?—Yes.

152. Q. Taking all the Divisions together, it is too high in some districts and too low in others?—I do not think it is too low anywhere.

153. Q. (Mr. Muir-Mackenzie.) In the last paragraph of your first note you draw attention to the fact that only a handful of the labouring classes came on relief works from the villages irrigated by canals?—Yes; I noticed that on the Jamda canals.

154. Q. Would it be fair to generalize from that that every village which had an appreciable quantity of its area irrigated by a Government canal would send either none of its population or only a small proportion on relief works?—Yes. One village in Pimpalner, in Khandesh, did not send a single person on relief works. In 1900 when we had a relief work on the Jamda canal for silt clearance, most of the labourers came from the neighbouring villages and very few from the villages under the canals.

ADDITIONAL NOTES BY WITNESS ON IRRIGATION WORKS IN KHANDESH DISTRICT.

I hope it will not be considered presumption on my part if I intrude on the valuable time of the Commission, by venturing to make a few further remarks in regard to irrigation works in Khandesh district, which I unfortunately omitted in my evidence before the Commission.

2. I beg to attach a list of storage works in the district which have been investigated from time to time and the details of which are given by Mr. Beale in his report. I would divide them into three classes:—

Class A.—Productive works.—Chunkapur Project is the only one that can be included in this. In the revenue forecast, Mr. Beale has assumed the proportion of crops the same as the last ten years' average figures on the Lower Panjra works. I beg respectfully to point out that these latter works are situated in the eastern portion of Central Khandesh, where cotton, the great enemy of irrigation, is extensively grown, whereas the scope of Chunkapur Project lies in the "Baglan" tract, where the people, from time immemorial, have been chiefly dependent on irrigation from the ancient *bandharas* with precarious water-supply. Cotton is not grown here, and the "Phad," or quadrennial rotation system, is largely practised in the irrigable lands, and generally as much as 50 per cent. of the area is devoted to sugarcane, rice, and other high class crops. (Bottom of page 5 of Mr. Beale's report.) For this

reason I beg to submit that under the proposed Girna Left Bank Canal and the extension of existing *bandharas*, the proportion of high class crops will be much higher than that on the existing Lower Panjra works, and thus the net return is likely to be more than double the figure assumed by Mr. Beale, viz., 1-5 per cent.; and I firmly believe the work will prove to be a productive one. Of course, a productive work of this kind is bound to be "Protective" as well. Experience has shown that famines of the present time do not mean dearth of grain in the country, but want of money, and employment to obtain that commodity. Systematic development of high class irrigation will mean so much additional wealth to the tract, and the employment the working classes will find among these irrigated fields in times of famine will be a sufficient "protection," and will obviate the necessity of opening relief works by Government.

Class B.—This consists of storage tanks for feeding the existing ancient "*bandharas* system." Owing to the high cost of the storage, these works are not likely to be directly "Productive," but their protective value will be immense. In the six valleys on which these tanks are proposed, there are at present 12,888 acres of permanently assessed Bagayot land, under 97 ancient masonry *bandharas*. The area used to be much larger over 50 years ago, and even in the recent survey settlement some portion has been converted into

"Jirayet" (dry crop land), owing chiefly to the paucity of water-supply, which I have been told has been on the decrease, owing to the destruction of the forests in the hills. In 1899-1900 I had been personally over many of the villages, and observed that most of the channels ceased to flow after December, and in others the discharge was very insignificant, and the loss to the irrigators, especially those that had no wells, was very great. I can quote one village (*viz.*, Antapur in Baglan Taluka) where more than half the "thal" had been lying fallow for several years, owing to scarcity of water, and yet the people had been continuing to pay the full Bagayet assessment. I recommended remission of revenue in this case, and I hope they got it. Remissions were granted for several other irrigation villages, but I am afraid the number was small and the compensation was in no way sufficient for the loss the people sustained. The people of these parts, unlike those of East Khandesh, are chiefly dependent on irrigation, and if the water-supply is ensured by the above storage tanks, the irrigation will rapidly develop and the whole tract will be immune from famine in future, and there will be no necessity of remissions. In years of drought, the employment, the labouring classes will find in the fields as mentioned in the previous paragraph will be a large indirect saving to Government. Therefore, it is recommended that the sooner these works are undertaken, the better it will be for the people and for Government.

Class C.—These works are meant to introduce irrigation in entirely fresh tracts, where it has never been practised before, and the projects too are very costly. and in regard to Raipur Tank there are professional difficulties. They will be very useful for concentration of large number of relief workers in times of famine, and I would recommend these works to be only reserved as such. There is no doubt that in a year of drought the tank water will be fully utilized for dry crops, but in ordinary years I have very great doubt as to the development of high class irrigation, especially under Raipur Tank—as cotton is the staple crop in East Khandesh. The Aner Tank being of masonry will afford very little work for relief purposes—and besides, it is too costly to be tried as an ordinary protective work. Karwand Tank may be tried as such, especially as rabi is largely cultivated here, but I may add the North Tapti region, being close to the Satpadas, rarely suffers from drought. The case of the Manad Tank is unique. The Janda canals are recent Government works in East Khandesh. They have not been financially successful, but, as the people have learnt the value of irrigation since their construction, there is no doubt that, if a storage tank ensures the water-supply, which is the chief drawback now, irrigation will extend and flourish, though not at the same rate as in the case of the other works under Class B. The construction of this tank is strongly recommended as an ordinary protective work.

3. The above deals with all the important projects in Khandesh, but over and above this, there is a very large scope for relief work in years of famine. one or two can be constructed in each Taluka or Petha for famine relief purposes. I may mention, for example, supplementary tank on the Konoli to feed the Bori system, also similar ones on the Punand, Aram, Panjan, etc. Besides these, there is almost unlimited scope for small village tanks, a great number of which already exist in a more or less ruined state, all of which can give ample employment for relief purposes. There is also another very useful form of relief work that could be started as test works in the beginning of a famine, *viz.*, silt clearance of existing channels and *bandharas*. I had recommended this in April 1900, but the famine was too far advanced then, and large concentrated works were needed. These test works can be undertaken in groups of four or five villages under the supervision of the Civil Department. The above programme is ample for the district and will obviate the necessity of breaking mountain heaps of metal to waste, or opening roads that the local funds cannot afford to keep up.

4. I am not in favour of construction of new *bandharas* and channels generally, unless the water-supply of the stream is perennial, or it can be replenished by storage tanks. They only silt up and cause trouble and disappointment. In Shahada and Taloda talukas, at the foot of the Satpadas hills (which are full of dense forests and the rainfall is very heavy), the streams, even in bad years, have a perennial flow. I may make particular mention of the Shahada *bandhara*, and channel (5 miles long) on the Gomai, that was restored by famine labour in 1896. In the exceptionally dry year of 1899-1900, the discharge was copious even in April. This small work irrigated 500 acres of dry crops that year which saved the three villages from starvation. I think similar experiments should be made on other streams in this region.

I would recommend the same in Navapur Petha in the remote west of Khandesh (which is really a part of Gujrat), where the mortality during the last famine was very heavy. There are several *bandharas* here in ruins, and these should be revived, as the streams here, being near the foot of the Ghats, are more or less perennial. The Executive Engineer for Irrigation is gradually taking up these works as minor works, but these works should be started on a much larger scale.

5. Much has already been said about the unpreparedness of a district as regards irrigation projects, in times of famine. In 1896 and also 1899 the Collectors of Khandesh and Nasik were very anxious to start irrigation works in place of metal-breaking and road-making, but I was only able to start one work, the Tulwada Tank, in 1899, which was completed in that season by 4,000 relief workers. The Purmapada Tank was badly wanted for relief purposes in November 1899, but owing to the incomplete state of the project, it could not be undertaken till May. If it had been started in the beginning of the season, I think with the 15,000 workmen available, the whole of this extremely useful work would have been completed by the end of the season. Similarly, I may mention Bahivel, Mulher, and Mansad Tanks. The projects, although roughly ready—some professional points had to be carefully considered by Government regarding them. The puddle trench, being deep, required skilful workmanship, and until this was completed, the embankment work could not be started by relief labour. I respectfully beg to submit that, if these projects are thoroughly sifted and the skilful portions, including outlet works, etc., are completed as ordinary works, in ordinary years, they can be utilized as once for relief purposes, when wanted, and lacs that are spent in useless metal-breaking work would be saved.

6. Mr. Beale has already mentioned in his report the desirability of employing a special staff of officers for survey and preparation of irrigation projects, but I would go further, *viz.*, to construct the difficult parts of the more useful projects of class B—as mentioned in the above paragraph, and that without further delay. I believe I am right in thinking that the final report of the Commission will not be ready before July or August, and if the Government wait till then, the special staff will not commence work till the next cold weather. If famine re-appears next year, we shall be in the same plight as before. I would therefore respectfully suggest that the special staff should be appointed now, without waiting for the final report of the Commission.

7. The above recommendations may briefly be summarized as follows:—

- (a) Early completion of Chunkapur and Purmapada Tank Projects.
- (b) Gradual construction of all the tanks of class B, as famine protective works, in preference to others of class C, as they are intended to improve and extend the existing *bandhara* irrigation, and are therefore likely to be very successful. A sum not less than one lac may be devoted every year for these works.
- (c) Speedy completion of the puddle trench and other difficult portions requiring skilled labour of Duhivel, Manad, Mulher Tanks, so that they may be undertaken as relief works, whenever necessity arises.
- (d) Construction and restoration of *bandharas* on perennial streams of Shahada, Taloda talukas and Navapur Petha.
- (e) Reserving tanks of class C for relief purposes only.
- (f) Early preparation, by a special staff, of a complete famine programme, so that one or two tank projects may be ready for each Taluka or Petha, in case of famine, as mentioned in the latter portion of paragraph 3.
- (g) To undertake silt clearance of channels in groups, and repairs to old village tanks, as test works in the beginning of a famine.
- (h) To do away altogether with metal breaking and road making by famine labour in Khandesh, as already too much money has been spent in this direction.

8. I trust that the Commission will not consider that my report is too exhaustive. These points I fully intended bringing forward in my evidence, but as the drift of the questions asked did not lead that way, I unfortunately omitted what I consider to be the chief points in my experience of Khandesh.

Mr. I. M.
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19 Dec. 01.

List of Storage Tanks in Khandesh Irrigation District that have been proposed and investigated or commenced.

No.	Name of tank.	Taluka.	Name of river dammed up.	Catchment in square miles.	Nature of catchment.	Gross capacity of tank.	Average rainfall.	Average irrigable area.	Scope of irrigation.	Area of existing permanent Bagayat in acres.	Cost.	Area submerged.	Assessment of col. 13.	REMARKS.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>Class A (Productive and Protective).</i>														
1	Chunkapur.	Kalwan.	Girna.	100	Ghat steep and hilly and forests.	1,398	95.83 (11 years, average.)	10,445	Feeds 8 bandharas and one canal, miles long.	1,846	R 13,32,522	1,260	1,260	Work commenced in 1876, also in 1884, and in famines of 1897 and 1900.
<i>Class B (Protective).</i>														
1	Mulher.	Baglan.	Mosam.	50	Ghat.	About the size of Dali-wel Tank. <i>Details obtainable in Khandesh Irrigation Office; not given by Mr. Beale.</i>	Ample for the storage.	...	Will feed 20 bandharas, present Bagayat area 3,360 acres, capable of extension.		Details not worked up.			Will submerge land and a village, compensation Rs. 1,000. Puddle trench deep over 60 ft. near the river gorge.
2	Daliwel.	Pimpalner.	Kan.	44.5	Ghat.	538	23.81 at Pimpalner.	2,504	58 bandharas and extensions.	7,326 acres.	R 5,77,505	534	524	Puddle Trench deep about 60 ft. on left bank.
3	Pankheda.	Do.	Panjra.	60	Ghat.	1,465	52.53 in catchment.	6,785			26 lacs about.	2,110	250	
4	Parnapada.	Dhulia.	Basi.	117	Steep and hilly, 50 miles from ghats.	408	22.76	52.75	Two bandharas and extension, two new canals.	818	6,54,916	540	270	Tank storage will be drawn for only seven months; river discharge sufficient for five months in average years; work started in 1900; one-third embankment done.
5	Markundi.	Kalwan.	Markundi.	About 50	Ghat.	About the size of Parnapada Tank.	<i>Details not given by Mr. Beale; can be obtained in Khandesh Irrigation Office.</i>	<i>Will feed seven bandharas; present Bagayat area 584 acres, which can be extended.</i>						

	Burai storage tank.	Nizampur Petha.	Burai .		To be prospected for.			10 Bandhas.	800 acres capable of extension.	R	No survey work done.	
6												
	<i>Class B (special case).</i>											
7	Manad .	Nandgaon .	Manad .	320	Over 50 miles from ghats.	1,366	27.5 (25 years).	10,233	Will feed Janda canals and extension.	11,20,336	1,807	2,200
									Average area irrigated by J. C. 2624 acres.			Puddle trench deep over 60 ft. in places.
	<i>Class C.</i>											
1	Karwand .	Shirpur .	Arnatu .	250	More than away from ghats in Satpudas.	1,393	25.72 (25 years).	7,086	New canal in new tract.	About 16 lacs	1,442	7,088
									Nil.			Puddle trench on left bank, very deep over 60 ft.
2	Aner .	Chopda .	Aner .	465	In the Satpudas full of forests.	4,865	(a) Heavy in the hills.	30,239	Do.	About 40 lacs	4,518	Forest lands.
									Do.			Tank too large for the command by canals.
3	Raipar .	Janner East Khandesh.	Waghur .	710	Steep and hilly more than 50 miles from ghats.	3,782	29.29 (10 years).	29,175	New canal .	About 37 lacs	4,160	6,440
									Nil.			Tank too large for command. For smaller tank waste weir would be costly.

NOTE.—(a) Mr. Beale gives the average rainfall of Shirpur and Chopda, which are below the tank site, as 27.57 inches; that on the catchment in the Satpudas is much heavier.

TWENTY-FOURTH DAY.

Poona, 20th December 1901.

WITNESS No. 55.—Mr. M. VISVESVARAYA, A.M.I.C.E., Executive Engineer for Irrigation, Poona.

Answers to printed questions.

I.

fr. M. Visvesvaraya. Preliminary.—In comparison with other parts of the Presidency, Government have expended large sums on irrigation works in the Poona District. The Mutha and Nira Canals are the two largest irrigation works in the Presidency, excluding Sind. The storage reservoir at Bhatghar, which supplies the latter canal, is the largest in India after the Periyar.

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All the new irrigation works for which Capital Accounts are kept are situated in the southern half of the district. The culturable area commanded by the works is 289,981 acres, or about 12 per cent. of the total culturable area of the district. There is room for further extension, especially in the northern half of the district.

The following table gives the Capital outlay, Revenue results, &c., of the irrigation works in the Poona District as compared with the works in the Presidency (excluding Sind) taken as a whole:—

	Whole Presidency excluding Sind.	Poona District.	Percentage of (3) on (1).
1	2	3	4
Capital expended Lakhs Rs.	263.23	131	50
Area irrigated in 1899-1900 . Acres	104,624	38,362	37
Gross Revenue in 1899-1900 . Rs.	7,25,564	4,86,847	67

According to the results of 1899-1900, while the Capital expended in the district was one-half, the gross revenue was two-thirds of the whole. The percentage of net revenue on outlay was 1.70 as against 0.7 only for the rest of the Presidency. The reason of more favourable results in this district is that large storage works which have an unfailing ghaut supply have been constructed in combination with canals which reach down to tracts of scanty or uncertain rainfall.

Paragraph 2.—The gross area of Poona District is 3,423,669 acres and the culturable area 2,502,754 acres. Area protected by Government irrigation works is 137,200 acres only, or 5.5 per cent.

The country is hilly and the culturable area varies from light sandy to rich black soil, generally with murum from 1 to 3 feet below the surface.

The rainfall varies from 18.5 inches at Lonavli on the ghauts to about 23 at Indapur in the eastern most taluka of the district. Except in the ghaut region, the average rainfall varies from 23 to 30 inches, but is generally below 25 inches.

In the western portion of the Poona District there is ordinarily no demand for water during the south-west monsoon except for perennial crops like sugarcane and garden crops. Water is required for these at intervals of 10 to 15 days according to nature of soil and rainfall.

Artificial irrigation is almost always in demand in the central and eastern parts of the district.

The following information relates to crops raised by irrigation:—

Nature of crop.	Period of the year when water is required.	Number of waterings required to bring the crop to maturity.
Perennial . . .	All the year round . . .	26 to 32
Eight months . . .	July to end of February . . .	12 to 15
Monsoon dry . . .	July to October . . .	1 to 4
Do. wet . . .	Do. . .	4 to 6
Rabi . . .	October to February . . .	3 to 6
Hot weather . . .	April to June . . .	6 to 8

The lighter the soil the more frequent the need for watering.

The distribution of water is controlled by dividing the irrigated area into sections in charge of Sub-Overseers and Inspectors and the sections again into sub-sections, each looked after by a Patkuri who distributes the water.

The area irrigated is measured each season by a special measuring establishment and demand statements are sent in to the Collector for realizing the water-rates.

The rates are levied according to the class and area of crops watered.

Paragraph 3.—Dams constructed of pure black soil are never satisfactory or safe. But black soil is used (sometimes with an admixture of sand) for the hearting or core of an earthen dam, with casing of murum or other suitable material. Masonry core walls are not in use in the Deccan. Black soil is good for sugarcane and garden crops grown by irrigation, but it requires manure.

On such soil there is demand for water for cereals and food-grain crops only in case of prolonged drought. Where there is chronic deficiency of rainfall, there is demand for water every year on black soil also.

Wherever the irrigation is limited to monsoon or rabi crops, the demand for water is slack in years of fair or good rainfall. With a perennial supply available for growing high class crops the demand is more or less sustained.

The revenue in this district depends chiefly on the area of sugarcane and garden crops for which water is available. Black soil is better suited for high class crops than any others, and it is no disadvantage to have black soil where the supply is perennial.

Owners of black soil desire to have irrigation works on account of the opportunities they provide for growing juari and other food-grain crops in a year of scanty rainfall and sugarcane and garden crops during years of normal rainfall.

Paragraph 4.—There are six irrigation works in this district, particulars regarding which are given in (1) the latest Irrigation Revenue Report and (2) Appendix X of my memorandum on Irrigation Works separately submitted to Government.

As the Superintending Engineer on special duty has collected this information, it is not separately given here.

The annual irrigation capacity and range of variation are given in Statement I attached.

The Nira and Mutha Canals can be depended upon in a season of drought. The other tanks are only partially successful in such seasons.

The rivers and streams in the northern part of the district are suited for extension of irrigation to that region. There are none now there except a few small old works of little or no value for irrigation in a season of drought.

Paragraph 5.—There are no Provincial irrigation works in the Poona District.

Paragraph 6.—There are very few village works in this district and these are used for drinking water and washing cattle. The construction of village tanks and weirs on small streams can be encouraged if funds are set apart for the purpose. The villagers concerned should be held responsible for their upkeep.

The village tanks will provide water-supply for men and cattle. When the tanks run dry, the subsoil water level in the neighbourhood will be high and wells in such places will supply water for irrigation as well as for drinking and domestic use.

Paragraph 7.—Construction of new wells can be stimulated by liberal advances to enterprising cultivators who are not in debt.

Enquiries show that during the drought of 1899-1901 the water-supply of wells ran short; only about 25 per cent. of the wells in the eastern part of the district were in use.

Depth of wells varies from 15 to 25 feet in *kachcha* wells and from 30 to 40 feet in *pakka* ones.

	Rs.	Rs.
Cost of <i>pakka</i> wells	1,000 to 1,500.	
„ <i>kachcha</i> wells and <i>buddies</i>	200 to 500.	

Paragraph 8.—There has been very little damage done in this district by water-logging or excess of water. No

drainage works are required. The cultivators use too much water when they are allowed with the result that the quality and value of crops suffer.

The rules for distribution and management of water which have been in force in this district for the past 16 months provide for light waterings and frequent closures of distributary channels and are calculated to prevent injurious effects from excess of water.

Paragraph 9.—The information under this head will be supplied by the Superintending Engineer, Central Division.

Paragraph 12.—Statement I attached gives the initial statistics asked for in Section I of the paragraph.

Information as per Section II is being supplied to the Superintending Engineer on special duty as far as possible.

Paragraph 13.—The scale of water-rates is given in statement I—F attached to the Irrigation Revenue Report for 1899-1900.

Applications for water are received by seasons and for perennial crops annually.

Outlets are opened in rotation and water is given on each distributary from the lowest field upwards. When all the fields are watered, the outlet is closed. Water for sugarcane is given once in ten days as far as possible, except towards the lower reaches where the supply is not constant.

During favourable rainfall the demand for water for cereals and food-grain crops is slack as already explained. For sugarcane and garden crops the demand is more or less constant and is partly independent of rainfall.

The water-supply of tanks in this district is so controlled that they are empty, or nearly so, by the end of June. The smaller tanks dry up earlier. In Lake Fife a proportionately larger supply is maintained to ensure the supply of water to the Civil and Military station of Poona.

The irrigation works get no credit for the increase of land revenue by reason of their construction.

In the Poona District the charges for maintenance and establishment are fair.

This is not the case in districts like Násik and Ahmednagar as explained in a separate memorandum.

14. The areas irrigated and the estimated value of crops are given below:—

NAME OF WORK.	Area irrigated.				Estimated Value of Irrigated crops.			
	1896-97.	1897-98.	1899-1900.	1900-01.	1896-97.	1897-98.	1899-1900.	1900-01.
	Acres.	Acres.	Acres.	Acres.	Rs.	Rs.	Rs.	Rs.
Nira Canal	42,543	47,574	27,300	51,728	32,49,775	12,06,613	20,08,095	39,73,012
Mutha Canal	6,457	12,691	8,725	8,204	13,34,068	11,19,724	7,35,637	18,32,792
Mátoba Tank	1,452	2,883	1,211	2,692	2,04,351	1,90,261	61,241	14,210
Kásurdi Tank . . . . .	...	142	...	15	...	2,225	...	15
Shirsuphal Tank	1,129	1,523	400	1,074	77,765	33,362	39,050	39,850
Bhádaivádi Tank	1,346	1,895	826	1,397	1,17,335	37,375	59,384	40,525
TOTAL	52,937	66,708	38,362	65,110	49,83,294	25,89,560	29,03,427	59,00,404

The year 1898-99, not being a famine year, is omitted.

All the villages under the first 25 miles of Mutha Canal and for about 60 miles of Nira Canal were protected. Not only this, but large numbers of people from unprotected tracks also found employment in field operations in connection with irrigated crops. The Minor works gave partial protection to from one to three villages only.

Assuming an average cultivated area of 1,800,000 acres for the district, and the yield in a famine year taken at an average rate of Rs. 6 per acre, the total valuation of the produce of the district will amount very roughly to Rs. 96 lakhs. The above table shows that the produce due to irrigation varies from 25 to 60 lakhs annually. This forms a very appreciable proportion of the total produce of the district, and bearing in mind that the wealth accumulated by means of irrigation works in previous years also helped to mitigate distress, it may be confidently asserted that but for the irrigation works the cost of relief in the district would have been increased by 25 to 50 per cent.

II.

A.—GENERAL.

1. The answers below refer to the Poona District in particular, but opinions of a general nature apply to the

Deccan Districts as a whole. I have served in the Khandedh Irrigation District and as Personal Assistant to the Superintending Engineer, Central Division, and have for the past 2½ years held executive charge of the Poona Irrigation District.

2. The average rainfall in each month of the year in Poona and Indapur, the two representative stations of the district, is as under:—

Month.	Poona.	Indapur.	REMARKS.
	Inches.	Inches.	
January	0·00	0·02	The average is taken for 10 years ending 1900.
February	0·10	0·09	
March	0·01	0·28	
April	0·86	0·50	
May	1·08	1·49	
June	5·73	3·03	
July	8·45	2·04	
August	4·51	1·86	
September	4·29	6·90	
October	5·32	2·97	
November	0·32	0·80	
December	0·00	0·03	

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3. (1) } No obstacles.
(2) }
(3) Yes. Slight for high class crops, but not serious.
(4) Yes. In the case of cereals and food-grain crops which do not require irrigation in a year of normal rainfall.
(5) Yes. Insufficiency of the supply of water in all cases in a year of drought and chronic uncertainty in the case of small tanks on the plains.
(6) No great obstacle from lack of capital in this district.
(7) { The fear of enhancement of revenue exists in the case of well irrigation, though it is in most cases groundless.
(8) {
(9) These are dealt with in a memorandum separately submitted by me.

6. As irrigation does not afford any special facilities or advantages for the cultivation of cereals and pulses, except during a drought, irrigated tracts do not attract any large number of cultivators. People with capital and enterprise sometime lease, for a time, land under command of irrigation works for growing high class crops.

There is a very strong desire among the people of this district for new irrigation works where there are none and for extended means of irrigation where works exist already.

B.—Canals of continuous flow.

7. (1) Two harvests in a year in irrigated tracts are rare, because black soil requires manure, and during years of favourable rainfall people do not go to the trouble of cultivating for two harvests, except where land is valuable.

(2) In this district wherever water-supply is good there is great demand for sugarcane and garden crops. Sugarcane is valued especially because the seed once sown gives from two to three harvests and occasionally up to six.

(3) In a year of ample rainfall there is no appreciable increase by irrigation in the value of the produce of land in the case of ordinary crops. In a year of scanty rainfall ordinary crops are improved by irrigation, and in a year of drought a good crop is obtained by irrigation where without irrigation there would be none.

If water-supply is available for perennial crops, the gross yield may be increased by about five times, but much depends on local conditions.

8. This depends on the nature of the water-supply and the crops grown.

(1) In the case of cereals the gross value of the yield is increased by about 20 to 70 per cent. with sufficient manure.

(2) The crop is saved from total ruin.

9. (1) On the Nira Canal the average water-rate paid to Government is about Rs. 3½ per acre. On the Mutha Canal the rate is much higher on account of the large area under sugarcane.

(2) About Rs. 4 for ordinary crops and Rs. 15 to 20 for sugarcane.

(3) Nil, except on second class irrigation works where a consolidated land and water-rate is charged.

In the first case, the rate is paid on the area actually irrigated during the year; in (2) sometimes on actual area and sometimes on the whole holding; in (3) on the whole irrigable area.

10. The expenditure to bring the water to the field varies according to the distance of the Government distributary and local circumstances. The work is usually done by the cultivators themselves.

Roughly, the initial cost of the field channels may be taken at about Re. 1 per acre and annas 4 for annual maintenance. For preparing land for sugarcane the rate is about Rs. 18 per acre.

The expenditure is incurred by the tenant who recoups himself by the value of the produce.

11. The health of the people is affected when there is irrigation too near a village. Government have prohibited extension of irrigation of perennial crops within a quarter mile round all villages under command of canals.

In places, the soil has also deteriorated as noticed by the poor quality of the crops.

On the Mutha Canal, the land has got water-logged in a few places, but the aggregate area is very small. The irrigation under the Mutha Canal is of about 25 years' standing.

The evil is arrested by the system of rotation now in force. Draining is resorted to by the cultivators with very satisfactory results.

C.—Canals of intermittent flow.

12 to 21. Works of this class are not numerous in the Poona district. I have a general idea of their management, but have no intimate acquaintance with the details.

22. There should be no objection to the construction of further canals by private persons who own the lands proposed to be irrigated. They may collect the necessary funds among themselves for initial outlay and consent to pay an enhanced water-rate on the area to be irrigated. Government might assist either by a contribution towards the construction of the work or by promising to forego water assessments for a fixed term after construction.

Before new works are undertaken, Government Engineers should inspect and report on the proposals to ensure that new works do not interfere with the supply to existing canals.

D.—Tanks.

23. (1) Tanks in the Poona District are replenished by rainfall.

The Matoba tank is fed partly by rainfall and partly by monsoon flow in the Mutha Canal.

(2) Water is conveyed by channels to the fields to be watered and controlled as described in previous answers.

(3) In a year of ample rainfall, throughout the year; in a year of drought, about the end of the cold weather depending on the rainfall.

(4) Depends on the size of tank and class of crops watered (*vide* Statement I attached).

26. Yes. When the supply from the tank fails, the cultivators who have sugarcane and other high class crop fall back upon wells for their supply. I consider wells should be specially encouraged in land commanded by tanks and by the tail portions of canals where the supply is not perennial.

30. The principal distributaries are maintained by the tank establishment; the field channels are kept in repair by the cultivators.

Approximate annual cost of maintenance is about Re. 1 per acre. With high class crops, it is higher. No legislation seems required.

32. Please see answer to question 22.

The construction of private tanks may be encouraged in seasons of drought to give employment to relief labour. The cultivators require special encouragement and concessions where the land to be submerged is not *Inam* or private land.

33. The accumulation of silt in Bhadalwadi and Shirsuphal tanks in this district has been at the rate of 0.3 and 0.09 per cent. per annum, respectively, calculated on the total capacities of the tanks.

In large reservoirs the accumulation is so small as to be inappreciable in a generation. In the Bhatghar Reservoir, under-slucices are provided to prevent silting.

34. (1) The average depth of pakka wells is 30 to 40 feet, and the level of water at the beginning of the hot weather may be taken at 20 to 30 feet below ground surface.

(2) Chiefly from springs and where the wells are under a canal by percolation from the canal. For purposes of irrigation only about 25 per cent. of the wells are useful in a year of drought.

There are very few localities where the water is saline in this district.

(3) Please see reply to paragraph 7 of memorandum above.

(4) About 75 years.

(5) By mōts only in this district.

(6) By a well of one mōt, 4 acres.

By one of two mōts, 8 to 10 acres.

(7) Varies according to crops and seasons and depth of water, but generally with a well of one mōt, 2 to 3 acres of sugarcane, 4 to 6 acres of fruit-trees or food-grain crops.

38. (1) Serious difficulties are experienced in the selection of a suitable spot.

(2) Not much difficulty in actual construction.

No expert advice is given in this district. It would promote confidence in well-sinking if such advice were available. If one trained Upper Subordinate of the Public Works Department is employed for two or three districts, he will be able with the aid of a small staff to take levels and trial borings and thereby offer useful advice.

39. Yes, to a limited extent.

Wells may be constructed at the junction of two or three fields owned by different owners.

The chief objection is the cost. The Government work will be more expensive, though very substantial, by reason of the cultivators' labour not being utilized.

I

Statement showing dimensions, cost, variations in results, etc., of irrigation works constructed, under construction or proposed in the Poona District.

Particulars.	EXISTING WORKS.						WORKS UNDER CONSTRUCTION.				WORKS PROPOSED.			
	Nira Canal (Bhatghar Reservoir).	Mutha Canals (Lake Fife).	Matoba Tank.	Kasurdi Tank.	Shirsapahal Tank.	Bhadralvadi Tank.	Shetphal Tank.	Khanason Tank.	Victoria Tank at Warwad.	Jamjarin Tank (Kara River Valley).	Purna River Reservoir near Dhannai.	ADDITIONAL STORAGE RESERVOIRS FOR MUTHA CANALS ABOVE LAKE FIFE.		
												Diviti Tank.	Siv Tank.	
Area and nature of catchment . . . Sq. miles	Steep hilly country.	Steep hilly country.	Hills and flat hill slopes.	Hills and flat hill slopes.	Hills and flat hill slopes.	Hills and flat hill slopes.	Flat ridges.	Hills and flat hill slopes.	Hills and flat hill slopes.	Hills and flat hill slopes.	Hills and flat hill slopes.	Steep hilly country.	Steep hilly country.	
Assumed average annual rainfall . . . Inches	128-00	196-00	10-00	6-00	23-00	23-00	2-33	10-75	42	210	97	42	45	
Full supply capacity of tank over sill of outlet . . . Mill. c. ft.	145	...	15-28	15-90	20-48	22-91	24	17-04	18-39	22-4	14-92	84-77	108-53	
Percentage of capacity above sill of outlet on average assumed rainfall.	5,312-84	3,833-18	229-00	14-83	365-00	222-00	592	228	299	2,186	5,000	757	973	
	12-3	...	The tank is fed by the Mutha Canal.	6-7	33-3	18-1	The tank will be fed by the Nira Canal.	The tank will be fed by Mutha Right Bank Canal.	16-6	20	19-8	9-10	8-60	
Water spread at full supply . . . Mill. sq. ft.	156-12	162-11	20-78	1-65	36-32	14-63	38-75	16-83	31-20	...	...	...	...
Maximum height of dam . . . Feet	126-95	106-70	48-41	93-45	54-32	55-09	66	52	47	84	94	94	94	
Total length of dam . . . Rs.	2,993	36-87	6,095	1,252	2,188	2,590	10,666	8,238	4,850	11,900	4,200	1,060	980	
Cost of dam . . . "	18,70,984	23,06,300	1,15,233	31,433	1,11,060	1,06,078	5,04,161	1,37,661	3,32,705	...	...	...	...
Do. of sluices . . . "				...						...	...	...	...
Compensation of land submerged by tank . . . "	2,23,294	3,31,893	5,534	...	4,079	4,190	38,000	4,000	13,200	...	...	...	...
Cost of canal excluding land compensation, establishment and plantation . . . "	18,52,295	16,59,988	...	...	...	...	...	...	...	...	...	...	...
Cost of distributing channels compensation, establishment and plantation . . . "	1,91,795	1,42,767	20,477	...	46,204	41,482	27,096	17,000	6,120	...	...	...	...
Total Capital cost including direct and indirect charges, 1900-1901 . . . Acres	56,85,011	66,68,720	2,01,422	45,590	2,24,568	2,27,422	7,50,877	2,08,858	4,59,549	18,70,661	33,22,409	7,64,939	7,31,382	
Annual estimated irrigating capacity . . . "	1,13,280	16,800	3,250	150	1,800	2,000	6,130	975	3,000	18,000	10,500	1,050	1,350	
Maximum area irrigated within the last ten years . . . "	51,728	14,061	2,883	189	1,523	1,895	...	...	...	...	...	...	...
Minimum area irrigated within the last ten years . . . "	18,246	6,457	885	...	177	299	...	...	...	...	...	...	...

Note.—The information given under "Works proposed" is very rough, as no complete surveys or detailed estimates have been prepared.

Mr. M. Visvesvaraya. Wells may be constructed if the cultivators are well-to-do people and agree to take water for specified areas for a fixed term of years. The wells should not be constructed too close, but at distances varying with the underground supply.

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40. Yes. Budkis, i.e., wells on the banks of nalas. They are useful for monsoon and rabi crops during years of drought and in ordinary seasons for vegetables and occasionally for perennial crops. When the rainfall is scanty, the streams also run dry, and their protective value is therefore limited. If a supply of motor appliances with fixtures are kept ready for sale or hire, it will be a great encouragement to well irrigation during seasons of drought.

III.—*Explanatory note, dated 31st December 1901, on the evidence given on 20th December 1901, before the Indian Irrigation Commission, by Mr. M. Visvesvaraya, Executive Engineer for Irrigation, Poona.*

From the experience in Northern India, Sind and the Madras Presidency, the Government of India usually associate improved management of irrigation works with extension of area irrigated. They have laid down that many of the irrigation works in the Bombay Presidency were undertaken "with the object of affording relief in seasons of drought" and of "furnishing a water-supply for cultivation in seasons of deficient rainfall." The impression has therefore prevailed that an extension of irrigated area is expected in seasons of drought, and that the water-supply in such seasons should be made available for growing as large an area of food crops and cereals as possible in preference to perennial and other valuable crops.

2. If the works are of limited value in normal seasons through slackness of demand, the Government of India naturally expect a large extension of area in seasons of drought. But there is no large extension noticeable. When the rainfall is normal and the supply abundant, the staple food crops do not require water. When the rainfall is deficient and there is demand for water, the rivers are low and the tanks not full, and the water-supply is not sufficient for the whole area classed as irrigable.

3. The members of the Commission have stated that it is not the desire of the Government of India that water should be reserved for food crops, in a season of drought at the sacrifice of richer crops, and that no restriction of irrigation of perennial and high class crops is intended in such years.

This interpretation does away with one of our chief difficulties, and clears the ground for the introduction of suitable measures for making the works more useful and remunerative. If worked on productive lines, the irrigation works in the Deccan will yield more revenue to Government and do much more permanent good than at present to the area served by them.

4. In clause (9) of paragraph 55 of my memorandum I have suggested a scheme for proposed scheme of *Value Management* of large works. fitably utilizing the water-supply of our tanks, under which the works would be protective during years of scarcity and productive in all other years. I have there proposed that the area under each work should be divided into three classes, namely, (1) the fixed, (2) the permissible, and (3) the dry crop.

As the Commission would place no restriction on the irrigation of high class crops in seasons of drought, the scheme can be simplified. I should now have only two classes, viz., (1) the fixed and (2) the permissible.

About two-thirds of the minimum water-supply available may be set apart annually for the "fixed" area. The remaining one-third and any surplus water there may be in good years may be used as at present at the discretion of the local officers for food grain or rich crops according to the character of the season and circumstances of the locality.

The "fixed" area will be distributed by villages, and each village may be given one or two blocks at a fixed rate of assessment per acre on the whole area of the block. Applications may be accepted for, and renewed once in, six or seven years.

It would not be desirable to guarantee water to other areas than those included in the regular blocks, as the waste of water in the channels will be large. There should be one channel and one outlet if possible to each block, and the water-supply should, as far as possible, be by measure.

If, with the same water-supply, the cultivators irrigate a larger area by a common understanding among themselves, the excess area, that is, area irrigated outside the block, may be separately measured and charged for.

Of the "fixed" area it may be stipulated that not more than one-third shall be sugarcane or other perennial crops.

Also the fixed area should not occupy more than one-fourth or one-third the total culturable area of the village.

The area should be large enough to make the whole body of cultivators take an interest in irrigation, but not too large to constitute a surfeit or to get water-logged. A small defined area in each village will enable people to concentrate their capital, manure and skilled labour, and to take the utmost advantage of the water-supply given to them.

The water-supply to the blocks may be guaranteed for six or seven years at a time as already explained and the rates of assessment revised at such intervals. The area assigned for the blocks may be changed also at each revision, if in the interval any portion of it has deteriorated by water-logging or other causes, or if the people desire a change.

During the monsoon, water may be given to food grain crops and cereals without water applications wherever the canal is large enough for the purpose. The privilege may be withdrawn by notification from the whole or stated lengths of canal whenever the water-supply is not in excess of what may be required for the "fixed" area.

Further details may be worked out according to the requirements of each locality.

5. The storage of the Bhatghar Lake is roughly 5,300 million cubic feet. Two-thirds of this, or about 3,500 million cubic feet, may be set apart for sugarcane and other perennial crops. At two acres per million cubic feet (the duty will be larger with block irrigation), this will suffice for about 7,000 acres. Twice this area or about 14,000 acres may be allowed for eight months and four months crops in rotation. Supposing half this area is irrigated outside the monsoon months, the additional storage required will be about 500 million cubic feet. The total storage reserved for the "fixed" irrigation will thus be 4,000 million cubic feet, leaving 1,300 million cubic feet for the permissible area, including rabi crops at the tail of the canal.

Water will ordinarily be available for monsoon crops without stint over the whole area.

These measures will introduce an element of fixity into the irrigation of the tract generally, give opportunities for the application of capital to land and time for the collection of manure, improve the revenue and bring increased prosperity to the villages under command.

6. I was asked why water applications should not be dispensed with. I will explain by concrete instances the difficulties likely to arise if the area irrigated were not kept under control by means of water applications.

In 1899 the water-supply of Lake Fife (Mutha Canal) was deficient by reason of the failure of the later monsoon rains. For two or three years previously the demand for sugarcane was slack on account of plague and the low price of "gul" or raw sugar. So we went on giving water for sugarcane to whoever asked for it till about April 1900. We then found we had only just enough water for crops already on the ground and had to restrict new sowings. As sugarcane cultivation was particularly profitable in that year, a large number of people had spent money on manure and prepared their lands notwithstanding they were warned by written notices. We did what we could to meet the demand, but the water-supply fell short of the demand and there was disappointment and complaints.

In the beginning of 1901 also, people were anxious to put down as large an area of sugarcane as possible, so much so that some of them extended their area of cane by stealth by utilizing for new sowings the water given for crops already sown. This had to be stopped by threats of penal assessment. If they had had their own way, the cultivators would probably have doubled the area. In all probability the supply would have failed in May or June, and crops valued at about Rs. 15 lakhs perished in whole or part.

Again, take the case of the Nira Canal. The storage at the end of the last monsoon was about 5,200 million cubic

feet. About half the supply is given for sugarcane and high class crops and the balance for rabi crops. The rabi supply will be used up before February next, leaving just enough storage to maintain about 5,600 acres of perennial crops till the next replenishment in June or July next. If no restrictions are placed on new sowings, the area would probably go up to 8,000 acres, and the water-supply would fail almost to a certainty in about May next, and crops valued at over 20 lakhs may be ruined.

Careful regulation of area is only possible when permission is taken for extensions on regular water applications. Otherwise the water-supply may fail in the hot weather, and the cultivators may be ruined. It costs Rs. 150 to Rs. 500 to prepare an acre of land for sugarcane. With borrowed capital, the risk of even a partial failure is too great for the ordinary cultivator, and one such failure will result in loss of confidence and a sudden contraction of area and revenue.

7. In Northern India, the water-supply is chiefly from large rivers. They prefer to admit into the canal as much water as they can take; for whatever supply is not drawn goes to waste down the river. They prefer to waste the water, if it should be wasted at all, along the canal where there is a chance of its being utilized.

In Bombay, on the other hand, we draw our supply from tanks or artificial reservoirs, and whatever supply is not drawn is so much saved for further use till the next replenishment. The supply saved may be used for extending the hot weather crops or for new sowings of sugarcane.

The demand for water for irrigation in Northern India is fairly constant. Here in Bombay, the area under an outlet may be 50 acres in one season and 500 in the next, depending on the character of the local rainfall.

Water is very expensive in Bombay. In Appendix II of my memorandum, I have shown that an expenditure of Rs. 100 has provided facilities for the irrigation of about five acres in Punjab, four in Madras and three in the North-Western Provinces. In Bombay the corresponding area is less than half an acre. It may be roughly stated that, on account of the great cost of storage, water-supply is three to six times more expensive here than on the other irrigation systems.

Careful regulation is important. On the Nira Canal, for instance, the hot weather discharge is frequently not more than 100 cubic feet per second in as many miles of canal. It is necessary to prohibit irrigation at the tail portions of main canal and distributaries, because more water is lost by percolation and waste in transit than is actually applied to the crops. Regulation is not possible without we know what area there is to water under each outlet, and for watering which the Canal Department has accepted responsibility. The areas have to be determined beforehand, approximately at least, if the regulation is to be effective.

8. I was asked why all the area under command of a canal should not be classed as "permissible." If this were done and water liable to be withdrawn from valuable crops on the appearance of scarcity, only rich people would risk capital, and there would be no great demand for canal water in ordinary seasons. The expense of using wells for a part of the year is large and the wells may fail. The risk is too great for the average cultivators who undertake cultivation with borrowed capital.

A further suggestion was that cultivators might be given water from year to year till they relinquished the area. This, if followed within safe limits, would be an improvement on the present system. The objection to it is the loss of water on a net work of distributary channels which are necessary for maintaining scattered patches of irrigation. The loss of water, especially during the hot weather, would be out of all proportion to the area watered. Concentration is most important for economizing the supply in the hot weather. Hence my suggestion for irrigation by blocks and the allotment of one or two blocks to each village. The blocks may be shifted from one part of the village to another once in six or seven years as necessary.

9. While I believe water applications in some form Water applications may be or other are a necessity on large dispersed with for small works, I have advocated their abolition in the case of the smaller works. I attach much importance to the suggestion made in section (10), paragraph 55 of my memorandum, to which I beg reference.

10. Closely allied to the recommendation in the previous paragraph is the one suggesting the transfer of small works to the Management of small works by Civil Agency. Revenue Department, vide clauses (8) and (12), paragraph 55 of my memorandum. Works costing, say, less than Rs. 3 lakhs, may be so transferred. Important or difficult engineering works may be maintained by the Public Works Department, but the maintenance of minor works, channels, etc., may be left to the villagers, under some recognized rules, for control by the local Revenue officials as in the case of the second class irrigation works. There are too many small works borne on the list of works for which Capital accounts are kept in this Presidency. The capital expended on works in Bombay is only about seven per cent. of the total expenditure for all India, but the number of works here is 40, out of a total of 124 (vide paragraph 15, also Appendix III of my memorandum). Small works are an exception in other Provinces. They should be constructed by the Public Works Department, but may be managed, as in Madras, by the Revenue Department. The revenue on these works is assessed and collected under rules not suited to them, the financial results are unsatisfactory, and, as the results affect irrigation works in the presidency as a whole, the larger works suffer by association with them.

IV.—Memorandum on Irrigation Works in the Bombay Presidency, excluding Sind.

1.—PRELIMINARY.

During the successive famines in the Deccan since 1896, the construction of a number of irrigation works, principally tanks, has been undertaken as relief works. With the re-establishment of ordinary agricultural conditions, the works are being closed one by one; and the question now arises whether the works should be left incomplete, until perhaps there is demand for them in a future famine, or they should be pushed on and brought to an early completion. Are the works to be regarded merely as aids to famine relief, or have they any higher value justifying the outlay and construction for their own sake? Before attempting an answer to this question, it is necessary to examine carefully the results of the irrigation works, already constructed in the Presidency, in the light of similar results of similar works in other parts of India.

2. A comparison of the financial results given in Appendix IV shows that the net return for the year 1899-1900, on the Capital outlay on irrigation works in Bombay, was 1.4 per cent., while the average for such works for all India was 6.4 per cent., and the maximum for any one province amounted to nearly 10 per cent. Comparing the areas irrigated in the same year (Appendix II), it will be seen that, while in every other province with the exception of Bengal, irrigation kept pace with the facilities provided, about a third only of the irrigable area in Bombay was actually irrigated.

3. *Opinion of the Government of India.*—These results which have been more or less the same in all recent years, have discredited the Bombay works in the estimation of the Government of India. The annual grants for new works have in consequence been curtailed and the strictest economy is enforced in the maintenance of existing works. The following extract taken from the Government of India Resolution noted in the margin is a forcible expression of the opinion of that Government on the operation as a whole:—

"The irrigated area of 1891-92 shows an increase of 21,207 acres which is said to be due partly to an increased demand for water caused by deficient rainfall and partly to the extensions carried out on some of the works. Considering that drought prevailed over a large area in the Deccan districts and that many of the major and minor works under notice were undertaken with the object of affording relief to that area in seasons of drought and that the acreage brought under command of a water-supply is very largely in excess of that for which water was taken, the increase in the irrigated area is much smaller than might have been expected. Viewing again the large expenditure incurred in the construction and upkeep of these works, the Government of India cannot regard as satisfactory the results obtained, and will be glad to receive from the Government of Bombay an explanation of the reasons why greater progress has not been achieved in

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4. *Object of this memorandum.*—One of the objects of this memorandum is to bring into relief the special features which differentiate the works of irrigation in Bombay from those of other provinces. For instance, an extension of the irrigation of the monsoon or other food-grain crops almost everywhere in India means an increase of revenue and improved returns on Capital outlay. But this is only partially true in Bombay. In 1896-97 the total irrigated area in Bombay exceeded that of the previous year by 57½ per cent., but the corresponding increase in the assessed revenue amounted to 2½ per cent. only. This shows that there are certain distinctive features in Bombay irrigation which have to be reckoned with, and which might necessitate modifications in the system of administration and assessments to adapt them to local conditions. The directions in which changes may be made with advantage will be indicated and the question will also be discussed as to how far the results and possibilities of these works justify the unfavourable estimate formed of them.

5. *Class of Irrigation works considered and basis of comparison.*—The irrigation works considered in this memorandum are those classed as Major and Minor Works for which Capital and Revenue Accounts are kept in the financial accounts of the Government of India. The results of working of the official year 1899-1900, as given in the Government of India Review of Irrigation Works in India for that year (*vide* Government of India Review No. 859—C. W. I., dated 28th July 1901) will be taken as the basis of comparison for the various provinces. Though the year was marked by famine conditions over a large area, the results of that year are fairly reliable as a guide to the relative value of the several systems at the present time. The results of other years will also be referred to as occasion requires. Out of the total outlay on new irrigation works in the Bombay Presidency (Deccan and Gujarat) more than 80 per cent. (*vide* Appendix IX) is invested in works in the Deccan. Whenever, therefore, Bombay works or Deccan works are referred to in the sequel, the whole group of works mentioned in the Irrigation Revenue Report for Bombay (excluding Sind) are meant. Sind is treated as a separate province for purposes of this comparison.

2.—CONDITIONS OF IRRIGATION IN BOMBAY COMPARED WITH OTHER PROVINCES.

6. *Financial results of Irrigation works in the various provinces.*—Details of Capital outlay and percentages of net revenue for Major and Minor Works for which Capital Accounts are kept are given in Appendix IV, from which the following figures are extracted:—

Province.	Total Capital Outlay to end of 1899-1900.	Percentage of net Revenue on Capital Outlay, 1899-1900.	Remarks.
	Million Rs.		
Bombay, Deccan, and Gujarat	25.78	1.4	Works in the Minor Provinces costing altogether about 105 lakhs are not separately considered in this comparison.
Bombay, Sind	21.75	8.7	
North-West Provinces and Oudh	90.14	7.2	
Punjab	96.68	9.9	
Madras	81.57	7.4	
Bengal	62.35	0.7	
All India, including Minor Provinces . .	389.78	6.4	

Out of the total outlay of 389½ million rupees, Bombay has received a little over 26½ millions, or nearly 7 per cent. for its share. During 1899-1900 four of the above six systems gave a return of over 7½ per cent., Bombay gave 1½ per cent., and Bengal less than ½ per cent.,

7. As a succession of unfavourable seasons in various parts of the country since 1896 created a demand for irrigation and in parts diminished the water-supply, it may be interesting to compare the above with the results before the famine.

The following table gives the corresponding figures for the year 1895-96:—

Province.	Total Capital Outlay to end of 1895-96.	Percentage of net Revenue on Capital Outlay, 1895-96.	Remarks.
	Million Rs.		
Bombay, Deccan, and Gujarat	26.07	1.2	Works in the Minor Provinces costing altogether about Rs. 72 lakhs are not separately considered in this comparison.
Bombay, Sind	14.57	6.7	
North-West Provinces and Oudh	84.69	8.2	
Punjab	82.04	5.6	
Madras	78.47	7.1	
Bengal	62.30	0.2	
All India, including Minor Provinces . .	353.34	4.3	

The comparison shows a marked improvement in the North-West Provinces and Punjab.

8. *Comparison of areas irrigated before and after the famines.*—The total areas irrigated on Major and Minor Irrigation Works for which Capital accounts are kept during 1895-96 and 1899-1900 compare as under:—

Province.	1895-96.	1899-1900.	Percentage of increase.
	Acres.	Acres.	
Bombay, Deccan and Gujarat	76,149	105,829	39
Bombay, Sind	1,205,038	1,572,457	30
North-West Provinces and Oudh	2,011,216	2,830,945	41
Punjab	3,149,519	4,957,891	57
Madras	2,940,317	3,236,341	12
Bengal	579,693	727,026	25
All India, including Minor Provinces . .	10,000,128	13,921,756	39

9. In Appendix V a comparison is made between the several provinces in respect of physical features, local peculiarities of cultivation, assessment, etc.

Bengal.—Bengal has an abundant rainfall, and irrigation is not practised in that province as an ordinary part of cultivation. Rice is the only crop for which irrigation is practised extensively in this province. Out of 754,577 acres irrigated in 1899-1900, 591,073, or over 78 per cent., were under rice. As Bengal shows even less favourable results financially than Bombay, that province need not be further specially considered for purposes of this enquiry.

10. *Sind and Punjab.*—In Sind the rainfall is very scanty, and cultivation is almost entirely dependent on artificial irrigation. Extension of cultivation is dependent almost entirely on the facilities for irrigation. The annual inundation of the River Indus fertilizes the soil, and the people are used to irrigation. Many of the old canals have been improved and extended. The new canals are constructed at a comparatively small cost, and are extraordinarily remunerative. The conditions in Sind and in South Punjab, where the practice is similar to Sind, are totally different to Bombay. In North and East Punjab the conditions are somewhat similar to the North-West Provinces, and will be referred to in speaking of that province.

11. *Madras.*—In Madras, again, the most extensive irrigation is in the deltas of the spring-fed perennial rivers like the Cauveri, Krishna, and Godavari. Irrigation is also practised from tanks chiefly for growing rice. Rice in that province is both a monsoon and rabi crop, and is not ordinarily grown without irrigation. The principal use of irrigation in Madras is the stimulus given to rice cultivation. Out of 3,229,024 acres irrigated in 1898-99, 2,977,008, or 92 per cent., were under paddy or rice. If rice is excluded, other irrigation, including the perennial, is small. Irrigation is thus mainly a question of rice cultivation in Madras.

12. *North-West Provinces.*—In the North-West Provinces irrigation is practised from large canals taken from rivers like the Ganges and the Jumna. These rivers are fed by the Himalayan snows, and contain a large supply of water throughout the year. As the rainfall conditions in the North-West Provinces are similar to Bombay, a good crop cannot always be depended upon in ordinary years. The difference between the two tracts, however, is that while monsoon or dry crops always benefit by irrigation in the North-West Provinces, the soil of the Deccan is such that irrigation is only of partial value for protecting the staple crops of the area except during severe drought. The area under wheat during 1898-99 was 895,389 acres out of a total irrigated area of 2,253,802, or nearly 40 per cent.

13. *Deccan, rugged and broken.*—Unlike the plains in the North-West Provinces and the river deltas of Madras, the Deccan country is hilly and undulating, and the construction of large canals, where feasible, is a matter of great expense.

14. *Necessity of storage tanks in Deccan Irrigation.*—Wherever irrigation is extraordinarily remunerative in India, it will be found to be dependent on inundation or perennial flow. There are no perennial rivers in Bombay fit for irrigation on a large scale without the aid of storage tanks. The rivers on which patches of irrigation exist carry large volumes of water in the monsoon, but they either dry up or dwindle into small streams of little or no value for irrigation in the hot weather. The cold weather supply is also small. For irrigating the higher classes of crops it becomes necessary to store water in the monsoon for supplementing the natural flow of the rivers throughout the year as required.

15. *Works small and scattered.*—Again, the Deccan works are small and scattered unlike the large system elsewhere. Out of 124 works in India for which Capital Accounts are kept, 40 are in Bombay (Appendix III). The average cost per work for all India is 30½ lakhs of rupees, while that of the Bombay works is 6½ lakhs only.

In large tanks there is comparatively less loss of water by evaporation and absorption than in small ones, and generally speaking large irrigation works are more remunerative than small ones.

16. *Labour scarce and expensive.*—In the North-West Provinces and Oudh the density of population per square mile is 436 (Appendix I), in Madras 252, and in Punjab 189; while in the Deccan, where the greater number of Bombay irrigation works lie, it is 165. The population is sparse and labour is comparatively scarce and expensive in the Deccan.

17. *Comparison with Madras tanks.*—The only other province, besides Bombay, where tanks exist on a large scale is Madras, though even there tanks are not the most successful irrigation works. The reason why tanks in the Madras Presidency are more remunerative than in the Deccan is that they are mostly of native origin and the Capital outlay shown against them represents in most cases the cost of improvements only and not the real total cost. A large number of the smaller tanks (not works for which Capital Accounts are kept) perform a useful office in Madras, namely, to protect the rice crop during a break in the weather, while similar tanks would be of little use in Bombay. The small tanks collect water in a heavy down-pour and give out during a break for the rice crop. In most tanks there is very little water left at the end of the cold season.

The soil of Madras in the districts where tanks are formed is generally more retentive, and the loss of water by leakage and absorption is less than is noticed from tanks and canals in Bombay.

18. *Cost per acre of irrigable area high.*—According to the reports for 1899-1900, the total irrigable acreage under command of irrigation works in the North-West Provinces is 3,076,000, and the Capital outlay on the works amounts to Rs. 901 lakhs, giving a rate of Rs. 29 per acre. The corresponding figures for Bombay are 316,425 acres and Rs. 268 lakhs, respectively, giving a rate of Rs. 85 per acre. The comparison is really more unfavourable than these figures indicate, because while nearly the whole of the area classed as irrigable is annually irrigated in the North-West Provinces, the area actually watered in Bombay is about one-third only of that estimated to be irrigable.

19. *Preponderance of black soil, Properties of black soil.*—A good harvest can always be secured in the North-West Provinces by supplementing the natural rainfall by artificial irrigation, whenever the former is found to be deficient. It pays the cultivator to seek the protection of the canal and to insure his crop by contributing a small

water-rate. In the Deccan, although similar climatic conditions prevail, the soil is not favourable for the irrigation of the staple crops of the province. Black soil, which is derived from trap rock, preponderates in the Deccan, and black soil has a peculiar property of retarding evaporation.

"The alluvial soil of the North," says Dr. Voelcker, "lends itself rather to canals, wells and shallow ponds and the rocky ground of Madras to the tanks as well as to channels, while the central or black cotton soil needs neither particularly." The same authority says that "the retention of excessive moisture in the soil produces a state of stagnation and coldness unfavourable for the supply of plant food."

20. *Black soil does not freely lend itself to irrigation.*—In good seasons the black soil of the Deccan yields a full harvest and in ordinary years a fair harvest. During a partial break or drought, canal water is not sought for to save the dry crops to the same extent as is done in Madras or North-West Provinces. Such waterings are even found to be harmful in certain places. It is only in a year of severe drought that irrigation of dry crops is really useful, and that there is any large demand for water for them. Also, irrigation without manure is found to impoverish the black soil.

21. *Principal food crops not dependent on irrigation in Bombay.*—The chief stimulus to irrigation elsewhere is the demand for water for food-grain crops. This is wanting in the Deccan. In the North-West Provinces there are two crops in a year. The area under wheat preponderates. Corn, cotton, and other principal crops are grown in the rabi season and require irrigation. In Madras, as already remarked, both the early and late rice require irrigation. This is why irrigation is so extensively practised in those provinces.

22. *Bombay cultivators not used to irrigation.*—A reference to Appendix I shows that the proportion of total irrigated area to total cropped area in Bombay in 1899-1900 was 4½ per cent., in Madras 25 per cent., in Punjab 72 per cent., and in the North-West Provinces and Oudh 33 per cent. The irrigation, here referred to, is from all sources, not merely from the Capital Account works with which the present enquiry is concerned. The figures bring out prominently the fact that irrigation is not an ordinary accompaniment of cultivation in Bombay.

One reason why well irrigation is not largely practised in the Deccan and Madras is that the sub-soil over wide areas is rocky, which makes well excavation a matter of great expense.

23. *Dry-crop irrigation will not pay in Bombay.*—During 1895-96 the area irrigated in the Deccan and Gujarat was 74,923 acres, and the assessed revenue from water-rates amounted to Rs. 4,52,476. During 1897-98, though the area rose to 126,516 acres, the revenue amounted to Rs. 4,93,139 only, so that with an increase of 69 per cent. in area the increase in revenue was about 9 per cent. only. In 1897-98 there was a considerable increase in monsoon and rabi irrigation due to drought. The rate for monsoon dry crops is generally Re. 1 per acre, and that for rabi crops Rs. 2 per acre. At present the average working expenses amount to more than Rs. 3 per acre. If the whole of the area estimated to be irrigable at present, which is about three times the area actually irrigated annually, were put under monsoon or rabi crops, there would be a reduction instead of an improvement in the present revenue from water-rates.

The works may justify their existence as "Protective Works," but the accounts will get no credit for mere increase in area. Increase in the irrigation of ordinary crops will never pay in Bombay. Water is too costly to be profitably applied to them.

24. *Financial success bound up with improvement in high class cultivation.*—During 1899-1900, although the area of perennial crops irrigated was only about 12½ per cent., the value of irrigated crops from the area was 47 per cent. of the whole. The area under perennial eight months, and special hot weather crops, for all of which high rates are charged, was only about one-fourth of the total area, yet the assessment on these three classes of crops alone paid over 70 per cent. of the total water-rates of the year (Statement G, Irrigation Revenue Report, Bombay). If the Bombay works are ever to prove remunerative, perennial and other high class irrigation should be largely encouraged in ordinary years.

If protection is the main object, and water-supply is to be reserved for dry crops, which may or may not take it while it could be otherwise profitably used for growing,

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3.—PRESENT POSITION OF IRRIGATION WORKS IN DECCAN AND GUJARAT.

25. *Importance of irrigation works in the Central Division.*—The following figures (Appendix IX) give the distribution of the works and the Capital outlay on them, among the three Public Works Divisions of this Presidency:—

	Number of Works.	Costs. Lakhs of Rupees.	Remarks.
Central Division	19	211	Works under construction or in abeyance are not included.
Southern do.	15	44	
Northern do. (Gujarat)	2	8	
Total	36	263	

The Capital outlay on works in the Central Division is over 80 per cent. of the total irrigation outlay in the Deccan and Gujarat. The greater number of the works and the most important of them are in this division. The area of uncertain rainfall in the Presidency is also the largest in the Deccan districts included in the Central Division.

26. *Works in the Northern Division.*—There are only two Capital Account Irrigation Works in the Northern Division (i. e., Gujarat) costing together about 8 lakhs. These are the Hathmati Canal and the Khari Out, neither of which paid its working expenses during 1899-1900. In favourable seasons the former pays about 1 per cent. and the latter 3 to 5 per cent.

27. *Works in the Southern Division.*—In the Southern Division also there are few works in areas of scanty or unseasonable rainfall. Almost all are, however, useful on the occurrence of a drought. The largest work which is the Gokak Canal, 1st Section, has cost a little over 13 lakhs. The Krishna Canal has absorbed more than 8½ lakhs. The former is new and the latter wants a storage reservoir. The question of providing storage works for the Krishna Canal is under consideration. The remaining tanks, of which there are only five costing more than one lakh (the largest not exceeding seven lakhs), call for no remark.

One peculiarity of the Dharwar tanks is that water assessment is collected on some of them along with land revenue as a consolidated rate.

28. *Works in the Central Division.*—Almost all the works in the Central Division are either situate in areas of scanty rainfall or afford protection to such areas. The largest are the four following:—

	Cost in lakhs of Rupees.	Net return based on Assessment during 1899-1900.	Percentage of net return on Outlay.
		Rs.	
Mutha Canals . . .	67	2,07,174	3.11
Nira Canals . . .	57	85,197	1.50
Mhasvad Tank . . .	21	26,195	1.26
Ekrak Tank . . .	13½	20,325	1.52
Total for all remaining works . . .	158½	3,88,891	2.14
Total, Deccan and Gujarat . . .	104½	46,594	0.45
	263	3,85,485	1.46

The net revenue from these four works formed 88 per cent. of the total net revenue. The remaining works in operation taken together paid less than ½ per cent. The first two works of the four mentioned above may be considered as very successful works, although the revenue is not yet sufficient to cover the annual interest expected upon

the Capital outlay. The Mutha Canal is the oldest work. Though constructed primarily for famine protection, a large part of its revenue is derived from the water-supply to the Poona City and the irrigation of the sugarcane crop. The canal is single-banked, and therefore expensive to maintain.

The Nira Canal is the largest and the most recent work in the Presidency, and it gives every promise of successful working. It has proved its great value in the recent famine. According to the results of 1900-1901 (a famine year) the canal irrigated 51,724 acres, or nearly half the total area irrigated by Capital Account works in the Deccan and Gujarat during the year. The value of crops amounted to about 40 lakhs of rupees. It is calculated that the area of food-grain crops irrigated gave crops sufficient to feed a population of more than 1½ lakh for six months. Without the canal the greater part of this area would have remained uncropped in such a year.

Both the Mutha and Nira canals are provided with storage tanks having ghāt catchments. The remaining two works mentioned above are on the Deccan plains. One of them, the Mhasvad Tank, has had its full supply level restored only recently, and the Ekrak Tank is handicapped by the unsatisfactory state of its canals, which, being single-banked, are expensive to clear and maintain. Both tanks are in areas of scanty rainfall, and do not fill during years of famine.

29. *Principal peculiarities of Deccan Works explained in Appendix X.*—The principal peculiarities of each of the 36 works will be understood from the information given in, and the brief explanations entered in the remarks column of, Appendix X, to which reference may be made.

Of the 36 works in operation, eight important ones are dependent on rivers with a precarious water-supply. Until storage tanks are provided for the latter, the best results cannot be had for the money invested in them. Nearly half the total outlay is on works which are admittedly incomplete or not in full operation.

30. *Reasons why Bombay Works have not satisfied expectations.*—The following are the principal reasons why the expectations formed of the Deccan works when they were first projected nearly 30 years ago have not been realized:—

(i) In the early days of irrigation it was accepted as an axiom that water was only to be brought to the land to be used. Experience with the black soil country has shown that extensive dry-crop irrigation is not to be hoped for except in a year of severe drought.

(ii) The principal food-grain crops of the Deccan are ordinarily grown without irrigation. There is no demand either for wheat, which is extensively grown in Punjab and North-West Provinces, or for rice, which is the principal irrigated crop in Madras and Bengal.

(iii) Any river, it was thought, would afford irrigation for dry crops. As the monsoon water-supply is abundant, extensive dry-crop irrigation was considered possible, and large areas were estimated as irrigable in an ordinary year. The areas thus originally estimated have been found to be erroneous, and the estimates have been considerably reduced within recent years.

(iv) In the original estimates sufficient allowance was not made for absorption, leakage and waste, and high duties were assumed. An examination of the working of the Mutha Canals in 1894 showed that the duty of water on that canal had been overestimated. Similarly, enquiries on other works have resulted in large reductions in the duties originally assumed.

(v) *Canals single-banked and leaky.*—The canals were designed in the early days of irrigation with single banks. The idea was that escapes would keep out silt. This has been contradicted by the experience of canals like the Mutha, Ekrak, and Jamda, which are single-banked and which require large sums annually to clear away silt.

Sufficient allowance was not made for leakage, which always takes place in muram ground. The investigation, already referred to, in connection with the Mutha Canal in 1894 suggested the necessity of restricting irrigation, rather than send down water a great length where wastage was out of proportion to irrigation.

Puddle lining or provision of a core of puddle is expensive, but it had to be resorted to stoppings of the larger leaks on the Mutha and Nira Canals.

(vi) The crop-rate system induces the cultivator to wait up to the last moment for rainfall before taking canal water. He then takes either too much water or too little, generally too much when he can, and the canal water gets the discredit for any damage to the crop arising from an overdose or misuse.

The formalities of the water applications and special measurements, etc., are also obstacles in the way of extension of irrigation.

(vii) The country being uneven, levelling and terracing are in some places expensive, and the cultivator, unless forced by drought, does not often think it worth his while to prepare his field and the channel necessary to lead water to it.

(viii) The rain water deposits its silt in storage reservoirs, and thus loses a great deal of its fertilizing quality before it is distributed for irrigation.

(ix) Canal water is considered too cold for garden cultivation, and well water is often preferred.

(x) The Deccan cultivator is heavily involved in debt. Irrigation of perennial crops requires capital and manure. Black soil requires a liberal use of manure to fertilize it. He does not often trouble to collect manure himself, and is too poor to purchase it.

4.—SYSTEM OF ADMINISTRATION AND ITS EFFECTS ON FINANCIAL RESULTS.

31. The reasons given in the preceding section for the disappointing results on the Bombay works are based on unfavourable natural conditions and partly on the defects or incompleteness of the works themselves. It will next be considered how far the system of administration, accounts, and assessments has operated in the same direction.

32. *Reference.*—Appendix VI is an authoritative statement explaining (1) the classification of works for purposes of account and (2) the sources from which funds are derived.

Appendix VII gives a summary of account rules and Government orders in force for regulating establishment and other charges.

Statement I-C attached to the Annual Irrigation Revenue Reports gives the main heads of revenue and expenditure.

33. *Administration of small Irrigation works.*—The 36 irrigation tanks and canals in the Deccan and Gujarat are spread over several districts. There are special Executive Engineers for irrigation works in Khandesh, Poona, and Dharwar, but in all other districts the works are looked after along with roads, buildings and other public works by the Executive Engineer of the district concerned. On small irrigation works, he is assisted by a Public Works subordinate, who may have several roads and buildings in his charge at the same time and who often has no special training or aptitude for irrigation work. He generally has no information on the financial results of his work. He gets instructions to debit such and such a charge to such and such a head of expenditure, according to certain rulings of the Code and the Examiner, not understood by him. If he does this and submits the usual statements on prescribed forms and sees that there is nothing very wrong about the upkeep, his duty to the irrigation work is discharged. Except in the special irrigation divisions, the Executive Engineer has his hands full with other work. As severe economy is enforced in maintenance, he finds it a struggle to ensure bare efficiency of the tanks and canals in his charge from a professional point of view. In judging of the efficiency of management, Government take into account both increase of area and net revenue. So, it is not clear to the Executive Engineer whether the water-supply should be reserved for valuable crops which pay best or for protecting food crops which pay least. He might try to extend irrigation by a few acres every year or save a few hundreds by reducing expenditure; and he would persevere to do so if favourable results followed his zeal for efficiency or economy. But he finds all his efforts rendered unavailing by a system of book debits made in his office and by the

Examiner, under which it is often impossible to show reliable working results.

34. *Book debits under 'Interest charges.'*—According to the Irrigation Revenue Report for 1899-1900, the total balance of interest charges on major works up to the end of that year amounted to Rs. 1,25,18,353. Under present rules, interest during construction for major works in progress is calculated at $3\frac{1}{2}$ per cent. per annum on the outlay at the end of the previous year plus half the outlay for the year itself. Funds are provided for new works according to the financial exigencies of the Government of India. The fact that the construction of a work is prolonged, is in most cases due to this reason, rather than to the necessities of its execution. Prolonged interruption is in itself the very reverse of beneficial, but when the interruption is caused because funds are not available, or a design is not completed or approved, the accumulation of interest charges in the interval becomes a mere matter of form.

Take for example the case of the Chankapur and Maladevi reservoirs. Both these works have been in abeyance for many years past (the Maladevi Tank work was recently re-opened for a short time as a relief work): in the one case because there were no funds, and in the other, besides want of funds, there were doubts as to the suitability of the design. All the same interest charges are being added to the total sum-at-charge. Up to the end of 1899-1900, the work's expenditure on the Chankapur Tank was Rs. 60,495 and the interest charges in the Administration Accounts amounted to Rs. 49,608.

35. *Book debits under 'Working Expenses.'*—The nature of charges for maintenance and management is explained in Appendix VII. Percentage charges were made for establishment under fixed rules instead of the actual expenses under that head. Appendix VII shows that the expenses of revenue management are affected by various fortuitous circumstances such as the classification of a district into Imperial or Provincial, the progress of large Capital Account works in the district, the extent of the yearly grants for other works in progress in the same executive division and so forth.

To take a specific instance, the Nasik District is classed as an Imperial Irrigation District, though the expenditure on Imperial Irrigation works bears a very small proportion to that on Provincial and other works. The result is that these other charges are debited with authorized percentages for establishment and the balance of the establishment of the whole district is written off *en masse* against Irrigation Major Works (working expenses) and Minor Works for which only Revenue Accounts are kept. The Executive Engineer, Nasik District, mentioned these circumstances in a report in 1898 and quoted the following debits in his accounts for April 1897 as an instance in point:—

Irrigation Major Works.

	Rs.
Works	44
Establishment Charges	4,947
Percentage of establishment charges on Capital outlay	11,243

This is, however, an extreme instance, but the fact that the rules allow of such debits shows that on some works at least real and unreal figures are mixed up so as to disguise the real operations.

36. *Effect of the accident of situation on financial results.*—The following analysis of the working expenses in 1899-1900 in two districts adjoining one another shows better than any general explanation can, how the accident of the classification of the district affects working expenses:—

District.	Name of Work.	Capital Cost. Lakhs of Rupees.	Cost of Revenue Management plus Indirect Charges.	Total cost of maintenance, including Share of Establishment.	Total Working Expenses.
			Rs.	Rs.	Rs.
Ahmednagar (Imperial)	Lakh Canal	3 $\frac{1}{2}$	11,097+1,640	3,488	16,225
	Ojhar Canal	3 $\frac{1}{2}$	12,035+1,765	3,584	17,374
	Bhatodi Tank	3 $\frac{1}{2}$	5,378+760	1,565	7,703
	Total	10 $\frac{1}{2}$	32,665	8,637	41,302
Sholapur (Provincial)	Mhasvad Tank	20 $\frac{1}{2}$	4,572+700	7,268	12,540
	Ekruk Tank	13 $\frac{1}{2}$	3,584+520	5,398	9,502
	Koregaon Tank	$\frac{1}{2}$	301+49	376	726
	Ashti Tank	8 $\frac{1}{2}$	1,039+215	3,055	4,309
	Total	43	10,980	16,097	27,077

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All the irrigation works in the two districts are given in the above table for an impartial comparison. Ahmednagar is classed as an Impartial District and Sholapur a Provincial one, notwithstanding that the irrigation works in the latter are about four times larger than those in the former. The maintenance costs more than revenue management on every work in Sholapur, while revenue management costs more than maintenance on every work in Ahmednagar. The two districts lie side by side, and there are no special characteristics in the works themselves to account for a difference. Yet the proportion of working expenses to Capital outlay is a little over $\frac{1}{2}$ per cent. in Sholapur and nearly 4 per cent. in Ahmednagar. A comparison of the results of the year 1895-96, that is, before the famine, gives very nearly the same percentages.

37. *Percentage of working expenses on gross revenue.*—The Government of India, in their annual review, compare the percentage of working expenses on gross revenue in the various provinces. The following figures are, for Major Work only, taken from the review for 1899-1900:—

	PERCENTAGE ON GROSS REVENUE OF	
	Cost of Revenue Management only.	Total Working Expenses.
Bombay, Deccan, and Gujarat	16.00	39.20
„ Sind	6.30	24.50
North-West Provinces .	9.80	31.80
Punjab	11.20	30.80
Madras	10.50	20.70
Bengal	26.80	77.90

The above comparison does not show the Bombay works in an unfavourable light. If the working expenses in Bombay are heavy, the gross revenue earned per acre is also high.

38. *Working expenses per acre of irrigated area.*—As regards working expenses per acre, the Bombay rate is far and away the highest. The following figures refer to the year 1899-1900:—

	Major Works only.	Major and Minor Works together.
Bombay, Deccan, and Gujarat	3.50	3.30
„ Sind	0.50	0.50
North-West Provinces .	1.10	1.10
Punjab	1.10	1.20
Madras	0.90	0.70
Bengal	1.90	0.90

The rates of working expenses per acre for 1895-96 (before the famine) do not much differ from those in this table. Comparison as above by the rate per acre irrigated is also erroneous. In a year of excessive rainfall the area irrigated will ordinarily be small, but the expenses of maintenance on account of floods and breaches on canals will be heavy. To judge of the efficiency of maintenance, by the cost per acre irrigated, in such a year will give a totally wrong idea of the year's operations.

39. *Costly revenue management and cheap maintenance.*—The direct charges under working expenses come

under two heads (according to Statement I-C of the Annual Irrigation Revenue Report), namely,—(1) *Revenue Management, (2) Maintenance and Repairs.

For the purpose of comparison under these heads, two important and self-evident propositions may be laid down, namely:—(1) that the expenses of revenue management should be proportionate to the area irrigated; and (2) that the charges of maintenance should be proportionate to the magnitude of the work which is roughly represented by its Capital cost.

Under this test the results for 1898-99 compare as follows:—

Province.	Cost of Revenue management per acre irrigated.	Percentage of Maintenance Charges on Capital Outlay.
Bombay, Deccan, and Gujarat	1.41	0.63
„ Sind	0.15	3.57
North-West Provinces .	0.47	2.10
Punjab	0.32	3.00
Madras	0.35	1.82
Bengal	0.80	2.72

Some of the works in Punjab, Sind, and Madras are very old, being native construction, and they have been recently improved by the Government. The capital cost of such works is not correctly represented by the outlay shown in the accounts. The high rate of revenue management in Bombay is partly due to a comparatively larger proportion of perennial crops. Notwithstanding these qualifications, the above comparison is very important, as it establishes the fact that the revenue management is most expensive in Bombay, while the maintenance is least so.

The excessive cost of revenue management is accounted for by the system of district administration and of book debits for establishment explained in paragraph 35.

Viewed as an ordinary Public Works question, the maintenance charges of any work are usually determined by a percentage on the original cost of the work. Works once constructed have to be maintained, whether or not they are used, in the same way that the repairs to a building are not materially diminished by the building not being occupied. Under this test the above comparison shows that the maintenance charges are really the lowest in Bombay, and do credit to the management.

In Madras, a maintenance grant of 2 per cent. on the original cost is usually allowed for the annual upkeep of the tanks. Such an allowance would be regarded as extravagant in the Deccan.

40. *System of water-rates assessments.*—There is also considerable variation in the manner in which irrigation revenue is assessed and collected in the various provinces. This is explained in Appendix V, column 7, to which reference may be made.

In Madras and Sind the water revenue is mostly consolidated with land revenue, and accordingly the expenses of revenue management are very low in those provinces (paragraph 39). The system followed in Bombay resembles that in the North-West Provinces, but while Bombay has all the disadvantages of that system, the owner's rates and the contribution from land revenue which are added to the regular water-rates in the North-West Provinces are denied to Bombay.

41. The system of accounts and assessments has been designed by the Government of India with special reference to the large irrigation works in the North-West Provinces and elsewhere. The same system is applied to the small and

* Government Resolution (Bombay) No. 12 A.I.—70 of 12th January 1895, defines "Revenue Management" to mean "those duties exclusively connected with the revenue on account of irrigation water supplied to cultivators, and by which the collection of revenue is regulated." Such duties include the distribution of water, inspection and measuring of crops, settling disputes as to canal water between irrigators, gauging discharges, receiving and submitting water applications, preparing assessment papers, etc., but are entirely independent of duties connected with the repairs or general maintenance of the work which are required to render the canal efficient to perform its function of carrying the water."

scattered works in Bombay, presumably for the sake of uniformity and administrative convenience. The result is, as here shown, that while the direct useful effects are minimized, the initial cost and subsequent maintenance charges are exaggerated by a system of book debits authorized by the rules.

42. An enquiry into the details of maintenance charges of irrigation works in Nasik and Ahmednagar in the past will show that they are burdened with book debits for establishment although only a small part of the establishment is really maintained for the works. The debits arise from the situation of the works in districts which, for no concern of heirs, are classed as Imperial.

5.—TRUE VALUE OF THE WORKS.

43. *Growth of Irrigation slow but steady in Bombay.*—For reasons connected with the black soil and the absence of demand for canal water for food-grain and other common crops, the growth of irrigation on these works has been slow. Up to 1884-85 the Capital outlay invested in them was 210 lakhs, and the results of that year showed an irrigated area of 39,665 acres and a net revenue of Rs. 55,090. The corresponding figures for 1899-1900 were 263 lakhs, 105,830 acres, and Rs. 3,35,485, respectively. Thus, in the course of fifteen years, with an increase in Capital outlay of only 25 per cent. the area irrigated has nearly trebled, and there has been a seven-fold increase in net revenue. The increase of revenue and improvement in the remunerative character of the works are of slow growth in Bombay, but experience shows that that growth is steady and certain.

44. *Value of irrigated crops.*—The value of crops per acre irrigated is also shown in Appendix II. The Bombay crops were valued at Rs. 59 per acre in 1899-1900, while the best in the other provinces did not exceed Rs. 38 or 65 per cent. of the Bombay rate.

45. *Value of the works if constructed and worked on commercial principles.*—The contract charges for designing and constructing similar works in Europe would be from 5 to 10 per cent. on the outlay. In Bombay it should not exceed 12 per cent., including land charges, while on Government works, as explained in Appendix VIII, it is actually about 30 per cent. Under Government, the work is spread over a long term of years, during which a large amount is allowed to accumulate in the shape of interest on the partial expenditure before the works begin to earn. Taking these and other similar circumstances into consideration, the cost of such works, if constructed by a private company or individual or on commercial principles by Government itself, would probably not be more than 75 per cent. of the capital value now charged in the accounts.

As regards maintenance, the private owner would be required to pay for expert advice at rare intervals, especially in the case of minor tanks and canals. The working charges (of which at present establishment forms about 50 per cent.) would probably be half, and the supervision and maintenance more close and efficient.

The private owner would sell the water according to the demand for it, unhampered by any rigid system of water-rates. He would advertise his supply and use his utmost endeavour to persuade cultivators to utilize all the water in the most profitable way to himself.

An irrigation work in the Deccan cost at present at the rate of about Rs. 200 per acre of land actually irrigated (Appendix X). To a private owner and to Government itself, when the present disabilities are removed, the cost would probably be about Rs. 120 per acre. The average yield per acre with high class cultivation may be estimated at about Rs. 65 in an ordinary year, and Rs. 85 in a famine year. The net profit would probably be Rs. 35 in the former case and Rs. 50 in the latter, or on an average, say, Rs. 40 per annum. If the owner of the irrigation work also owned the land, the net return to him would be from 20 to 40 per cent. on the capital invested.

The private owner would sell the water to the crop which pays him best. He would not reserve the water-supply for the protection of dry crops belonging to other people if his object was to earn a large return. The present poor returns on the works are due, among other causes, to the practice of assessing water revenue without reference to local conditions. The Executive Engineer is required to keep his tanks and canals up to a certain standard of efficiency, and when he has done this the water may run to waste or remain locked up in the tanks for all he cares. There is no co-operation between the supplier and the purchaser. The cultivator is not bound to take the water nor

the Government to give it, and in assessing water revenue, no account is taken of the character of the season or the market prices of the crops.

The above is a hypothetical case intended merely to illustrate the true value of an irrigation work. It is not of course recommended that the construction or maintenance should to any large extent be entrusted to private agencies. The illustration is put forward to show that the tanks and canals are not constructed or worked on a commercial basis that the results should be judged too strictly on commercial principles.

46. Among other advantages of irrigation works may be mentioned the following:—

Direct and indirect benefits from irrigation.—Irrigation works are most useful during construction as famine relief works on account of the useful employment they provide to large bodies of relief workers.

In a year of great scarcity, dry crops under command of an irrigation work are protected to the utmost capacity of the work, while unwatered lands in the neighbourhood would be absolutely unproductive.

In good years, perennial and other valuable crops can be grown, which add to the wealth of the country. In times of scarcity people can fall back on the surplus of good years.

Loss of land revenue on the irrigable area is averted in a famine year.

No other improvement is so effective as irrigation, in an agricultural country, for keeping the cultivator to his village and for preventing dismemberment of families and village communities on whose prosperity the regularity of the receipts on account of land revenue depends.

Irrigation works materially reduce the numbers flocking for Government aid on the appearance of a famine.

Fodder is grown for cattle and a water famine is of rare occurrence in the neighbourhood of an irrigation work.

The growth of food crops in a famine year in the irrigated areas helps to keep down prices and is indirectly of service to the neighbourhood and the whole country.

These and other advantages do not admit of direct money valuation, but they are not on that account to be ignored in criticising the value of the works to the State.

6.—CONCLUSION AND RECOMMENDATIONS.

47. Most of the conclusions in this memorandum were derived by a study of the results of irrigation works before the famine. Tables were originally prepared for 1895-96. The results of 1899-1900 are marked by a large increase in the area irrigated and gross revenue everywhere, more especially in the Punjab, North-West Provinces, and Sind, but there is no appreciable variation in the relative value of the results as affecting this enquiry.

48. The principal object of this memorandum, as already explained, is to bring into prominence the distinctive features of Bombay irrigation, so that if their existence is considered as established, the necessary changes in the rules and in the treatment of the works, in consonance with local conditions, may be made with a view to improve the revenue and thereby pave the way for further extension of the works. In point of financial results, Sind stands at the head of the Provincial systems or nearly so. As Sind works are officered from the same staff of Public Works Department Engineers as those of the Deccan and Gujarát, it may be concluded that the comparative ill-success of the latter is not due to any lack of efficiency in the administration.

49. As was observed already, the conditions of irrigation in Sind and Punjab are very different to those in the Deccan and Gujarát. Cultivation over large areas is impossible in the former without artificial irrigation.

Madras and Bombay (Deccan and Gujarát) fall under a different category. There is no great difference between the two provinces in respect of well irrigation. The percentage which the area under well irrigation bore to the total cropped area during 1899-1900 was 4.89 in Madras and 3.40 in Bombay. But in regard to canal and tank irrigation, while the percentage for Madras was roughly 19½, that for Bombay was about 4 only. This great inequality is accounted for by the great demand for rice cultivation in Madras. Excluding rice, the area for Madras in 1898-1899 was 252,016 acres and for Bombay 96,406 acres. The former, being less than two and three-quarter times the latter, will appear small and even unsatisfactory when it is remembered that the relative capital outlay is more than three times.

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The chief reason for the inequality is the difference in soil and climate and the absence of deltaic areas in Bombay for the cultivation of rice.

50. In all provinces any large extension of irrigation is dependent on the demand for water for food-grain crops, namely, cereals and pulses. As a general extension of irrigation to cereals and pulses is rendered impossible by peculiarities of soil and climate, sugarcane, and other high class crops might be encouraged in the Deccan by a system of rules and management specially adapted for their development.

51. It was remarked before that while the financial results are judged in a commercial sense, the works are not administered on a commercial basis. To begin with, most of the works owe their origin to famines. They are commenced without sufficient preparation at a time of pressure. When the famine is over, either the works are kept on for a subsequent famine or completed slowly as funds allow. In the meantime, the partial outlay remains unproductive and an account of interest charges is maintained. During 1899-1900, repairs to irrigation canals and tanks were undertaken to provide work for famine labour, and in some cases the outlay incurred was heavy. The returns for the year on such works were in consequence unsatisfactory. We have seen that in some cases debits are made for establishment not really employed on, or required for, the works. During famine years, water is given for protecting dry-crops as on the Nira Canal by withdrawing the same from high class crops and, therefore, at the sacrifice of canal revenue. While both during construction and maintenance the works subserve in this way a variety of purposes of public policy and civil administration, Government should be content with a lower rate of return for the capital than the strictly commercial one. Either the financial results should not be taken as a test of success, or the works should be managed on a strictly commercial basis.

52. It must be admitted that the Bombay irrigation works will never make a mark as Productive Public Works. No large outlay on the scale of Sind or Punjab is justifiable here. The capital outlay per acre actually irrigated is about Rs. 200, the average value of the produce will be about Rs. 70, and the gross revenue, say, $\frac{1}{10}$ th of the produce or Rs. 6.5. The working expenses amount to about Rs. 3, leaving a net revenue of Rs. 3.5 and a net return of about $1\frac{1}{2}$ per cent. on the capital outlay. If managed with due regard to local conditions, the works can be made to pay over 2 per cent., and if constructed and managed on strictly commercial lines more than 3 per cent. The indirect advantages to the State do not admit of valuation, but there is no doubt that the State picks up in a variety of ways the full productive value of the outlay.

Successive Famine Commissions have urged the extension of irrigation works as a protective measure. During the quinquennial period ending 31st March 1891, the annual outlay on new works was 5 to 10 lakhs. This was reduced to one and a half lakhs in 1895-96, and to less than one lakh in the following year. The subsequent expenditure does not count, as it was all, or nearly all, for famine relief.

An annual outlay of from 6 to ten lakhs, or about 2 per cent. on the land revenue of the Presidency, would be a reasonable provision in this respect. This outlay would be little more than the interest on the expenditure incurred in the famine of the past two years. It would be necessary to lay down a definite policy in this respect for, say, ten years at a time.

53. Irrigation works in this Presidency have a limited protective value. The tanks on the plains do not generally fill in a year of drought. When the rainfall is good, the crops are good also, and there is no demand for water except for a limited class of crops. The Nira Canal is developing into an ideal protective work, because the storage reservoir has a ghat catchment, the supply from which never fails. The canal supplies a tract where the rainfall fails frequently and is almost always defective. Areas in other parts of the Deccan which lend themselves to the construction of such works should receive the first consideration. The experience of the writer on the Nira Canal is that, if managed with an eye to revenue, the work can be made to give a return of over three per cent. During 1900, the cultivators were consulted as to their willingness to bind themselves to take water for selected areas for fixed periods of 5 or 6 years. There was a very ready response. Applications were received for about 18,000 acres in the upper half of the canal. They were willing to pay Rs. 10 per acre, and to bind themselves not to grow sugarcane or other crops, requiring a supply in the hot

weather, except on a fraction of the area. At present, the productive value of the work is marred by the exigencies of protection in seasons of drought, and water cannot be given entirely for crops which pay the highest water-rate and for which there is demand.

54. A "Productive Work" is also largely "Protective." If a work is managed so as to get the best return from it every year, not merely as a reserve for the protection of ordinary crops in seasons of drought, the wealth produced in normal seasons will help to mitigate distress in times of scarcity.

Practical Recommendations.

55. A number of recommendations and suggestions will now be submitted as a logical sequence to the foregoing enquiry to indicate in what directions improvements are necessary and possible. One of the objects in putting these forward is to reconcile the protective with the remunerative character of the works. The suggestions themselves are doubtless capable of considerable modification and development when the difficulties and objections likely to be raised are met, and the expert knowledge of Revenue and Account officers is brought to bear on them.

(1) It would seem desirable to lay down a definite policy to be followed without hesitation for a period of, say, ten years at a time, and to decide on a maximum average expenditure of Rs. 8 to 10 lakhs annually on irrigation works in the Deccan and Gujarat. A larger sum than this may be spent on works, if any such are found, on which the outlay is directly productive. There should be no sudden changes of policy.

(2) If Government decide upon further extension of irrigation works and a liberal expenditure of money on the scale suggested, an officer of the rank of Executive Engineer, 1st grade, or of Superintending Engineer may be attached to the Secretariat. He will work as a personal assistant to the Chief Engineer, collect technical information for Government, investigate projects, watch progress and maintain a continuity of policy both as regards construction and maintenance. Such an officer would be very useful, especially if he looks upon himself as a helper and adviser rather than as a critic of Superintending and Executive Engineers, and he is not burdened with heavy office work.

(3) The construction of small village tanks and river weirs may be encouraged, and an expenditure of Rs. 2 to 3 lakhs from Provincial Funds set apart annually for the purpose. Small tanks will store water in flood time and give out during a break. They will maintain the sub-soil water at a high level in the neighbourhood. Well irrigation might be encouraged in combination with small tanks. Where each would fail without the other, the two together might be mutually helpful and justify the outlay. (This suggestion is, however, outside the scope of this enquiry as it relates to works for which Capital Accounts are not kept.)

(4) On long canals it is not usually possible to supply water throughout the year for perennial irrigation towards the tail. On the Mutha Canal, for instance, water is given for sugarcane and other perennial crops dependent on wells in the lower reaches during the monsoon only, in the middle reaches for eight months, and in the upper reaches where they are not so dependent throughout the year. In a similar way well irrigation may be systematically encouraged in such localities to the mutual benefit of the cultivators and of canal revenue.

(5) There is a number of small tanks costing Rs. 2 lakhs or less included under "Minor Works and Navigation" in the Bombay list, which might be handed over to the Civil Department for maintenance. The capital outlay on them may be written off against the Surplus Imperial Irrigation Revenues. Such small works are not maintained by the Public Works Department in other provinces even as Provincial Works. Important repairs might be carried out by the Public Works Department staff, as is at present done on the second class irrigation works in Khandesh, Nasik, and elsewhere. An arrangement may also be made for a periodical inspection and report on these works by an expert to ensure that nothing very wrong in the management is allowed to occur.

(6) Large tanks should be constructed, as far as possible, in preference to small ones where a choice exists, and preference should be given to streams having ghat catchments. In the case of small tanks (Capital Account Works also), the excavation of wells below them should be encouraged to make the two mutually helpful.

(7) Levels may be taken, and a careful survey made of the various districts to see if any very large schemes are possible. An ideal protective work would be one comprising a storage reservoir with a ghat catchment and unfailing rainfall, and a long canal or canals like the Nira which will carry to supply to plains where the rainfall is scanty and uncertain. The country should be surveyed to see where such schemes are possible, and the most feasible and profitable of those taken in hand first. Such canals besides always affording protection to the monsoon crops irrigate a large area of rabi according to the supply stored.

(8) Very large canals may be taken from rivers with ghat catchments to the arid plains in Sholapur, Nagar, and Bijapur and other districts where possible. Such canals may fill depressions and small tanks along their course, and irrigation may be practised from small tanks, pools, etc., instead of direct from the canal. Irrigation direct from the canal by inundation might also be attempted. In a broken country cross drainage would be costly, but all small nalas might be intercepted with suitable overflow weirs. Such canals may be used in a sense as inundation canals. They will distribute moisture over a large area in a season of drought and will help well irrigation as well.

(9) At present, only about a third part of the area classed as annually irrigable, is actually irrigated in ordinary years. The works have been constructed at much expense, but the cultivator is not bound to use the water, even though his land may benefit by it. In a year of scarcity, Government may not be willing to give water for perennial crops. This uncertainty and want of touch between demand and supply has a large moral effect in retarding development. It is astonishing how carefully water is utilised on second class irrigation works in Nasik and Khandesh where a consolidated rate is levied. The water-supply on many of those works is precarious, but as the cultivators are obliged to pay for a fixed area, whether or not it is watered, they are careful to take the utmost advantage of the supply available. As it is found that the same area cannot profitably grow perennial or other valuable crops in successive years, they have adopted a system of crop rotation, according to local circumstances, by changing the crops and the intervals at which they are shown.

The old works furnish an analogy as to what might be done with advantage on the new works. The future success of the latter depends on some such arrangement as the following :—

In a number of villages under command nearest the head works from $\frac{1}{3}$ to $\frac{2}{3}$ of the total culturable area might be classed as a *thal* or irrigated area, and a fixed water-rate put on it for a term of, say, six years. This area will have the first claim on the water-supply during that period. The total extent of this fixed irrigation should be, say, about one-third the area that the tank or canal can permanently irrigate.

The remaining water-supply should be used in ordinary years for growing high class crops and during years of scarcity or famine for the protection of dry-crops. There will thus be three classes of irrigation, namely,—(1) the fixed, (2) the permissible, and (3) the dry-crop. The rate for permissible irrigation should be sufficiently low to cover the loss occasioned by the interruption of high class cultivation and the diversion of water-supply for the use of the dry crops when the occurrence of a drought renders it necessary.

This arrangement will ensure about two-thirds of the water-supply being made available for perennial or other valuable crops in all ordinary years, and the same quantity for food-crops in a year of scarcity.

In the second division, the area of permissible irrigation, the cultivators should be encouraged to construct wells (by *takavi* advances if necessary) to supplement the canal supply at times of deficiency, or to fall back upon when the canal supply is stopped or diverted to save the dry crops. The practice of supplementing the canal supply from wells is one largely followed on irrigation works in all parts of India with most encouraging results.

In those years in which the water-supply is diverted for food-crops, the water-rate on the permissible area should be partially remitted according to circumstances.

Where no hardship is liable to be caused, the assessment on dry-crops irrigated should, as far as possible, be on a full area of the field, so that no measurements may be necessary.

In order that the majority of the cultivators of a village might participate in "fixed" irrigation, an arrangement might be come to by which the irrigable land is shared by nearly all the people of a village by the lease of plots for the period for which the area is classed as irrigable. The areas may be fixed after the cultivators come to an understanding among themselves in this respect. Government will forego the liberty of raising the water-rates at pleasure, but the possible loss of revenue will be very small compared with the improved receipts arising from fixity of irrigation.

The works under this arrangement will be protective in a year of scarcity and productive in all ordinary years. It will also lead to the concentration of irrigation and saving in expense on distributary channels.

(10) The crop rate assessment with its attendant formalities is a cumbersome and costly process for small works especially. It should be gradually changed into a consolidated rate on as many works as possible. Under the smaller works, areas which can be conveniently irrigated every year may be classed as *permanent bajayat* and a fixed canal water-rate levied on them for a period of, say, ten years at a time. Rules for the equitable distribution of water under all the varying conditions of supply might be laid down for the guidance of the village Panch. A special officer may give advice and control such cases. The consolidated revenue will tend to greater permanency of irrigation and will save a large amount of unprofitable work to the Public Works Department.

(11) If the annual returns are to represent the actual transactions and to be a guide to future improvement, such arbitrary debits as those described in paragraphs 35 and 36 ought to be impossible. The account rules may work very well on large irrigation systems where, owing to the magnitude of the revenue operations, the burden of establishment is not felt. The Bombay works are so small and the revenue operations on such a limited scale that even the pay of the subordinate in charge often counts. If the same official is on a work for a long time, the net revenue diminishes as he receives promotion and his salary increases. The remedy lies in a new grouping of works and in a re-adjustment of the establishment employed according to actual requirements. The Executive Divisions are created for civil works and serve a variety of administrative purposes and, bearing this in mind, each work and service should be debited with a proportionate share of the cost of establishment according to the service rendered. If the charges are in any year excessive, no single work or service should be made the scape-goat. The excess should be debited to, or distributed over, all the works and services. In that case, the evil will soon be cleared itself and find its own remedy.

(12) In the case of the smaller works, only the dams and masonry works of exceptional importance should be in charge of the Public Works Department. The channels should be left to be maintained by the cultivators under the supervision and guarantee of the Revenue Department. Such repairs as cannot be effected by the cultivators themselves, should be attended to periodically by the Public Works Department, as on the second class irrigation works at present.

(13) For improved administration, a number of works, say, 15 or 20, should be formed into one group on which trained minor officials could be interchanged.

The subordinates of the Public Works Department should be offered higher rates of travelling allowance in view of the difficulties of travelling in tracts imperfectly supplied with communications. This will also act as an inducement to them to remain on and take an interest in irrigation works.

(14) Irrigation projects should be prepared after a systematic examination, along their whole course of the nalas or rivers where such works would be useful. In the past, projects have received attention chiefly on the occurrence

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(15) A thorough inspection should be made of every irrigation work at fixed intervals of 6 to 9 years and a short report published with the proposed triennial Irrigation Revenue Report at such intervals. A knowledge of the history, defects and wants of a work, which such a report would furnish, will add greatly to the efficiency of maintenance. Such information can only be collected at present by laborious search into old records which few officers have the time or opportunity to make. Unless a work is thus periodically examined and a programme of treatment laid down, annual repairs, such as silt clearance and maintenance of drainage works tending to the permanent efficiency of the works, are liable to be neglected and the establishment will be tempted to seek cheap credit for economy by minimising or postponing such repairs.

56. The system of design and management of irrigation works still followed is essentially on the lines projected more than 15 years ago when the office of the Chief Engineer for Irrigation was abolished, and the strength of the special staff reduced. Enough is now known of the result of that system and the conditions under which only irrigation can be practised with any degree of success in the Deccan. The sanguine expectations in regard to financial results originally entertained have not been realized. The time is now ripe for a study of the financial and other results on these works, with a view to determine the precise limits within which further extension is desirable and to arrive at a definite policy to be followed in regard to them in the future. It might then be decided how many and what classes of works started in the recent famine should be taken in hand and in what order and at what rate of progress they are to be carried to completion. There is a very large area in the Deccan where the rainfall is uncertain and distress frequent to which the protection which irrigation works can give would come as a great boon.



APPENDIX I.

Agricultural Statistics showing the extent of Cultivation and Irrigation in the several Provinces.

[NOTE.—The figures for area and population are according to the Census of 1891. The areas in columns 6 to 11 are taken from the Agricultural Statistics of British India issued by the Director General of Statistics, 1901.]

Provinces.	Area. Square miles.	Population. Millions.	Density of population per square mile.	Net area cropped in 1899-1900. Acres.	AREA IN ACRES IRRIGATED DURING 1899-1900 FROM						Percentage of area of Tank and Canal Irrigation, columns 6 to 8, on total cropped area, column 5.	Percentage of area irrigated from Wells, columns 9, on total cropped area, column 5.	Percentage of total irrigated area, column 11, on total cropped area, column 5.	REMARKS.	
					Government Canals.	Private Canals.	Tanks.	Wells.	Other sources.	Total.					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Bombay, Deccan and Gujarat	77,275	15.99	*207	19,278,203	99,829	5,013	30,443	657,789	78,149	871,223	0.70	3.40	4.52	* Density in— Gujarat . 286 Deccan . 165 Karnatak . 200	
Bombay Sind . . .	47,789	2.87	60	2,781,014	2,352,433	140,595	...	41,005	110,414	2,644,447	89.65	1.50	95.09		
Total, Bombay . .	125,144	18.90	151	...	...	...	...	...	...	...	...	...	...
North-West Provinces and Oudh	107,503	46.91	436	33,026,912	1,981,373	5,692	2,192,077	6,121,685	634,048	10,934,875	12.66	18.54	33.11		
Punjab	110,667	20.87	189	12,976,798	4,243,524	823,729	20,049	4,154,598	134,083	9,375,983	39.29	92.02	72.25		
Madras	141,189	35.63	252	23,122,215	2,648,160	26,289	1,632,527	1,129,804	146,986	5,783,766	19.49	4.89	25.01		
Bengal	151,543	71.35	471	53,253,600	754,577	...	...	...	...	755,577	1.40	...	1.40		
Other Provinces . .	...	...	...	...	...	...	...	...	...	...	...	...	...
All India	964,993	221.17	229	180,151,093	12,333,737	1,310,723	4,388,375	12,287,218	1,224,003	31,544,056	10.01	6.83	17.51		

APPENDIX II.

Comparative Statement of Land Revenue, Irrigated Area, Value of Irrigated Crops, &c. (All India.)

REFERENCE:—Government of India Review of Irrigation Works, No. 859—C. W. I., dated the 26th July 1911. Irrigation Revenue Reports for 1898-99 of the various Provinces.

Province.	1	2	3	4	5	6	7	8	9	10	11	12	REMARKS.
		Total Revenue as shown in Financial Accounts, 1898-99.	Land Revenue, 1898-99.	Capital Outlay on Irrigation Works for which Capital Accounts are kept, 1898-1900.	Capital Outlay on Irrigation (Major Works only), 1898-1900.	Estimated value of Crops under Capital Accounts (Major Works only), 1898-1900.	Average value of Crops per Acre (Major Works only), 1898-1900.	Area estimated as irrigable by the Works for which Capital Accounts are kept, 1898-99.	Area actually irrigated by Works for which Capital Accounts are kept, 1898-1900.	Percentage of area in column 9 on area in column 8.	Area irrigated per Rs. 100 of Capital Outlay columns 4 and 9, 1898-1900.	Estimated value of Crops per Rs. 100 of Capital Outlay (Major Works only), columns 5 and 6.	
		Million Rx.	Million Rx.	Million Rx.	Million Rx.	Million Rx.	Rs.	Acres.	Acres.			Rs.	
Bombay, Deccan and Gujarat		Not available.	Not available.	2.68	1.96	40	58.7	316,425	105,829	33	0.39	20	
Bombay, Sind		Do.	Do.	2.17	1.78	1.81	22.5	1,746,900	1,572,457	90	7.25	102	
Total, Bombay		14.80	4.72	4.85	3.74	2.21	25.2	2,063,325	1,678,286	81	3.46	59	
North-West Provinces and Oudh.		12.51	6.64	9.01	8.72	9.52	36.0	3,076,000	2,830,945	92	3.14	109	
Punjab		9.36	2.57	9.67	9.45	16.39	37.4	5,026,390	4,957,894	99	5.13	173	
Madras		14.29	5.04	8.16	7.20	5.38	19.4	3,316,632	3,286,344	99	4.03	75	
Bengal		20.63	4.05	6.23	6.16	2.52	34.7	1,485,150	727,026	49	1.17	41	
Other Provinces		29.84	4.44	1.05	0.27	...	...	...	441,261	...	...	...
All India		101.43	27.46	38.97	35.54	36.02	31.6	...	13,921,756	...	...	101	

APPENDIX III.
Irrigation Works for which Capital and Revenue Accounts are kept (*All India*).

REFERENCE I.—Government of India Review for 1899-1900 of the Revenue and Expenditure on Irrigation Works in India.

Provinces.	NUMBER OF IRRIGATION WORKS.				AREA IRRIGATED IN 1899-1900, ACRES.				MAJOR WORKS, 1899-1900.			MINOR WORKS.	REMARKS.
	Productive.	Protective.	Minor Works.	Total.	Productive Works.	Protective Works.	Minor Works.	Total.	Rate of assessed Revenue per acre.	Cost of working per acre.	Percentage of working expenses on gross Revenue.	Rate of assessed Revenue per acre.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bombay, Deccan and Gujarat	7	6	27	40	26,370	40,857	38,602	105,829	6.6	3.5	30.2	3.9	
" Sind	8	NIL.	7	15	808,140	NIL.	764,317	1,572,457	1.9	0.5	24.5	2.2	
North-West Provinces and Oudh.	5	1	4	10	2,616,872	36,622	177,451	2,830,945	3.6	1.1	31.8	1.9	
Punjab	7	1	5	13	4,226,866	158,106	572,922	4,957,894	3.5	1.1	31.3	1.9	
Madras	8	1	25	34	2,686,874	81,794	517,676	3,286,344	4.0	0.9	20.7	3.2	
Bengal	3	...	1	4	727,026	NIL.	NIL.	727,026	1.9	1.9	76.9	...	
Other Provinces	1	...	7	8	...	...	441,261	451,261	...	...	...	...
All India	39	9	76	124	10,601,233	317,379	2,087,455	13,921,756	3.4	...	...	2.3	

APPENDIX IV.

IRRIGATION WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT.

Comparison of Financial Results for the year 1899-1900.

Province.	CAPITAL OUTLAY TO END OF 1899-1900. THOUSAND RS.				Gross (Irriga- tion Revenue).	Working Expenses.	Net Revenue on all Works.	Percentage of net Revenue on Capital Out- lay, Produc- tive Works.	Percentage of net Revenue on Capital Out- lay, Protec- tive Works.	Percentage of net Revenue on Capital Out- lay, Minor Works.	Percentage of net Revenue on Capital Out- lay, all Works.	REMARKS.	
	Productive Works.	Protective Works.	Minor Works.	Total									
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Bombay, Deccan and Gujarat	10,978	8,631	7,174	26,783	Rs. 7,25,564	Rs. 3,54,644	Rs. 3,70,920	2.44	1.14	.06	1.4	1.2	
Bombay, Sind	17,774	Nil.	3,976	21,750	26,67,541	7,85,831	18,81,707	6.51	...	18.23	87	67	
Total, Bombay	28,752	8,631	11,150	48,533	33,93,105	11,40,478	22,52,627	4.93	1.14	6.54	4.6	3.2	
North-West Provinces and Oudh	82,857	4,374	2,913	90,144	96,61,971	31,94,912	61,67,059	7.71	...	2.91	7.2	3.2	
Punjab	90,328	4,730	2,226	96,684	1,48,46,180	52,77,676	95,68,504	9.84	9.57	12.69	9.9	5.6	
Madras	67,288	4,746	9,537	81,571	82,44,287	22,41,773	60,02,514	8.12	.89	5.25	7.1	7.10	
Bengal	61,629	Nil.	707	62,346	17,70,900	13,52,275	4,18,625	.68	...	.21	.67	0.2	
Other Provinces	2,682	Nil.	7,807	10,499	9,35,435	6,17,205	3,18,230	...	...	15.97	3.0	14.2	
All India	333,556	21,881	34,340	389,777	3,88,51,878	1,38,24,319	2,50,27,559	6.77	2.41	5.58	6.4	4.3	

APPENDIX V.

Statement showing physical conditions, local peculiarities of Irrigation and sources of Irrigation Revenue, etc., in the various Provinces.

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No.	Province.	Density of population per square mile.	Rainfall in irrigated areas. Rough average. Inches.	Source of Water-supply.	Local peculiarities of Cultivation and Irrigation.	Sources of Irrigation Revenue and manner of Assessment.
1	2	3	4	5	6	7
1	Bombay, Deccan and Gujarat.	207	20 to 26	The water-supply is from tanks and small rivers or from a combination of both. The rivers not being perennial, irrigation cannot be successfully practised from them without the aid of storage reservoirs.	The country is rugged and broken. There being no perennial streams in tracts suited for irrigation, large canal systems, such as are found in Northern India, are not possible. The works must necessarily be small and scattered. Irrigation in Bombay is not carried on by the diversion of snow-fed or spring-fed rivers as in Northern or Southern India. Except on some minor streams water has to be collected in costly tanks and taken in canals which run over broken country requiring expensive cross drainage works. The black soil which preponderates in the Deccan possesses the peculiarity of resisting evaporations and is unsuited for the irrigation of crops ordinarily grown by rainfall.	Receipts consist to a great extent of "Occupier's" rates as in Bengal and are not supplemented by "Owner's" rates as in the North-West Provinces, nor by a share of land revenue.
2	Sind (Bombay)	60	Below 5 inches.	Irrigation is chiefly by inundation canals from the Indus. The supply in the river though abundant in all seasons is specially large in the kharif season when the Indus floods rise to a sufficient height to command a large tract of country.	Cultivation without artificial irrigation is practically non-existent in Sind. The annual inundation brings in a lot of silt which fertilizes the soil. Till recently irrigation was largely dependent on the character of the inundation in each year. The works now in progress are intended to give to Sind a permanent system of irrigation.	The revenue from the canal consists almost entirely of share of land revenue which is divided in the ratio of 90 per cent. to irrigation and 10 per cent. to land.
3	North-West Provinces.	436	24 to 40	Irrigation is chiefly from perennial rivers, the Ganges and the Jumna. These rivers are fed by springs as well as by the Himalayan snows and carry a large supply of water even in the hot weather.	In upper India there are two harvests in the year. The corn, cotton and other principal crops which benefit by irrigation are grown during the cold season when the rivers are at their lowest. There are only five major works in the North-West Provinces, the largest of them being the Ganges canal completed in 1854. Though few in number the canal systems are very large and continuous. The country has a gradual slope of from a foot to 18 inches per mile. In favourable seasons food crops can be raised without the aid of artificial irrigation. But where artificial irrigation is available it is almost always made use of.	Direct water-rates are assessed partly on the occupier and partly on the owner of the land, the bulk of the rates falling on the former. The receipts are further increased by a not unimportant contribution from land revenue.
4	Punjab	189	13 to 17	The rainfall is ordinarily insufficient for cultivation, and irrigation is either from perennial rivers like the Jumna or from inundation canals (as in Sind) from the river Indus and its tributaries.	The conditions in the west and south are similar to those in Sind; in general Punjab resembles the North-West Provinces with which it is contiguous.	The system of water-rate assessment is similar to the North-West Provinces.
5	Madras	252	25 to 50	Irrigation is carried on a large scale on the river deltas where the water-supply is perennial; also by a large number of tanks, mostly of old native construction, extended and improved by the British Government.	The question of irrigation in Madras is mainly one of rice cultivation. Over 90 per cent. of the irrigated crops is rice. On most systems only one crop is raised in a year and this is irrigated in the rainy season when the rivers are in flood. Irrigation works are of great importance here as they are absolutely necessary for securing a harvest of rice in all years, specially good harvests. In the deltaic areas the use of water begins in the immediate vicinity of the dam or weir. Comparatively simple works are sufficient for irrigation. The difference of level between the river and the country is so light that a moderate height of dam suffices to lift the water into the irrigation channels.	The bulk of the irrigation revenue is collected, and on most of the works is consolidated with the land revenue.
6	Bengal	471	40 to 50	Irrigation is from perennial rivers like the Mahanadi and the Sone.	The Ganges delta is very favourable for irrigation, but the rainfall, which is abundant, makes the country practically independent of artificial irrigation in all but famine years.	System of assessment same as explained against Bombay (Deccan and Gujarat).

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APPENDIX VI.

Note on the classification of Irrigation Works for purposes of Account.

Reference:—Government of India Resolution No. 177—L., dated 26th July 1892.

For purposes of account, irrigation works are divided into two main classes; Major and Minor.

Major works again are subdivided into—

- (a) Productive works, which term is applied to projects that are estimated within ten years after completion to yield a return of at least 4 per cent. on the sum-at-charge, i. e., the direct and indirect Capital outlay *plus* the accumulated arrears of simple interest.
- (b) Protective works which do not necessarily fulfil the above condition, but are undertaken in order to protect certain tracts from famine.

Minor works of irrigation are again subdivided into—

- (a) Those for which Capital and Revenue Accounts are kept.
- (b) Those for which only Revenue Accounts are kept.
- (c) Those for which neither Capital nor Revenue Accounts are kept.

Agricultural works, which term is applied chiefly to river embankments, are included among Minor works and are subdivided in the same manner.

2. Funds for Capital outlay on Major works are at present provided in all cases from Imperial resources.

In the case of Productive works, the capital outlay is principally from borrowed money. This is supplemented by grants from Imperial revenues out of the sum set aside annually for famine Protection and Insurance. The Revenue outlay on these works is also Imperial, except in Bengal and the North-West Provinces, where it is Provincial.

For Protective works the capital outlay also comes out of the provision for famine Protection and Insurance, the charges on the Revenue Account being also Imperial.

In the case of Minor works, the Capital outlay is from Imperial Revenues in Rajputana, Baluchistan Upper Burma, Bombay (except the Gokak Storage Works) and the Punjab. In Lower Burma, Bengal, the North-West Provinces, and Madras it is Provincial. The Revenue outlay follows the same division.

3. Receipts on Revenue Account are of two kinds—Direct and Indirect.

Direct receipts consist principally of the occupier's or water-rate levied on irrigated lands and of the owner's rates on the same land, the assessments being made as a rule by the Public Works Department, but the receipts realized in the Revenue Department. They also include realizations on account of the sale of water for sundry purposes, for the water-supply of towns, from plantations and other canal produce and for water power, navigation receipts, rents of buildings, fines and miscellaneous, which are all realized by the Public Works Department. Direct receipts are credited to Imperial or Provincial in the same way as the Revenue outlay is debited.

Indirect receipts are realized in the Revenue Department and consist of the share of the enhanced land revenue due to irrigation, or, in other words, a portion of the increased land assessment that is levied on land brought under the command of an irrigation work. In the case of all Major works these receipts are credited to the works in the Finance and Revenue Accounts. In some provinces, however, and notably in Madras, the water-rates though separately assessed are collected with the land revenue, and in the case of those works for which Capital and Revenue Accounts are kept are also credited as indirect revenue in the Finance and Revenue Accounts.

In the case, however, of all Minor works, no credit is afforded on account of these indirect receipts, which are included in the general land revenue.

Indirect receipts are credited to Imperial in all cases, a proportion of the total land revenue which includes these receipts being assigned as the Provincial share under the contract system.

As regards expenditure, the Finance Accounts show all direct charges for both classes of works, but not the indirect charges on account of capitalization of abatements of land revenue and of leave and pension allowances.

APPENDIX VII.

Summary of Account Rules in force for regulating Establishment and other charges.

Public Works Department Code, Volume II, Chapter XIV, 2119.—When one fund or one branch of the department executes work for another, the charges for Establishment and Tools and Plant will be regulated under the following rules:—

Establishment.—The charge will be calculated at the rate of 23 per cent. on the outlay on Works and Repairs (excluding certain items specified in clause IX of rule) *plus* 5 per cent on the revenue realized from Civil or Military Works and 10 per cent. on all direct revenue realized from irrigation Works.

Special Revenue Establishment.—Where a separate Establishment is entertained for the collection and management of Irrigation Revenue, the whole cost of that Establishment will be debited to the fund concerned instead of the 10 per cent. charge referred to in the preceding clause.

Distribution of charges within Provincial and Local Branches of a Province.—When the establishments are Provincial or Local, the Local Government or Administration may apportion the charges for Establishment and Tools and Plant between Provincial and Local Civil Works in such proportion as may be considered desirable.

2. *Public Works Department Code, Volume II, Chapter XIV, 2120.*—The establishment charges in the executive divisions of the Irrigation Branch should be apportioned between the several classes of works carried out in those divisions under the following rules:—

- (a) All charges for Establishment arising in executive divisions in which only Capital works are in progress and all charges for Superintending Engineers and their officers employed wholly in superintending Capital works will be debited monthly to Capital.
- (b) In divisions where both Capital and Revenue outlay is being incurred, the charge to Capital for Construction Establishment will be made month by month at 18 per cent. on the outlay on Works and Repairs, the balance of the charge for Establishment after deducting the sum charged to service heads, other than Irrigation, being debited monthly to the Revenue Accounts.
- (c) In the case of mixed divisions primarily kept up for maintenance purposes, in which—
 - (1) outlay on Capital works;
 - (2) outlay on works for which neither Capital nor Revenue Accounts are kept;
 - (3) Revenue outlay on works for which Capital and Revenue Accounts are kept;
 - (4) Revenue outlay on works for which Revenue Accounts only are kept;

are all in progress, the debit for establishment to the 1st and 2nd of these classes of works will be in accordance with the preceding rule, the balance of the charge after deducting the sum charged to Major heads other than Major Irrigation heads being divided between (3) and (4) in proportion to outlay.

- (d) In the case of a mixed division in which the outlay on Capital works is so large that it may be fairly considered that the division is kept up primarily for Capital works, the charge to the Revenue Account for establishment will be regulated in accordance with Rules II and III, the balance of the charge after deducting the sum charged to Major heads other than Irrigation Major heads being debited to Capital.

3. The Government Resolution quoted in the margin Government Resolution No. 230— indicates the nature and A.I.—1903, dated 14th December extent of the application of the code rules in the two preceding paragraphs to outlay incurred on Works and Repairs in this Presidency.

The charge is 23 per cent. divided as under—

Administration (Secretariat and Accounts)	2½ per cent.
Superintending Engineer	2½ „
Construction (Executive Engineer and Establishment)	18 „
TOTAL	23 „

The Secretariat is Provincial; so $2\frac{1}{2}$ per cent. of the Establishment charges on Imperial Irrigation Works is invariably credited to Provincial Establishment.

The remaining $20\frac{1}{2}$ per cent. is credited to Imperial Irrigation Establishment if both the division and district are Imperial. If one of these is Provincial and other Imperial, credits out of $20\frac{1}{2}$ per cent. are made to the fund concerned, for the division at $2\frac{1}{2}$ and for district at 18 per cent.

4. The marginal Government Resolution explains the Government Resolution No. 12 charges debitable to Revenue Account.

(1) *Charge at percentage rates.*—This is a percentage on expenditure and provides for the executive and subordinate establishment employed on maintenance and repairs.

(2) *Share of subordinate establishment employed on revenue management.*—This is on account of the time spent on the duties of revenue management by the subordinate establishment.

(3) *Special Revenue Establishment.*—This is establishment such as measurers, patkaries, etc., specially employed in connection with the revenue management.

(4) *Direction charges.*—This is either a share of actual cost or a percentage on expenditure to cover the cost of Chief or Superintending Engineer and a percentage charge for Secretariat and accounts.

(5) *Collection charges.*—This is a percentage on the revenue which is credited to the Revenue Department and debited to the work on account of the collection of revenue by Revenue officials.

5. The Government Resolutions noted in the margin explain the nature of the charges for assessment and collection of revenue by Revenue officials, referred to in clause 5 of the preceding paragraph.

The charge for collection only on irrigation works is. . . 5 per cent.

For lands watered in Native States.

The charge for collection only is. . . 7 per cent.

The same including measurement when the latter is not made by the Irrigation Department . . . 10 „

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APPENDIX VIII.

IRRIGATION WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT. NATURE OF CHARGES INCLUDED IN CAPITAL OUTLAY.

The following table gives an analysis of the total Capital Outlay in the Bombay Presidency, excluding Sind, to end of 1899-1900.

Item.	Capital Outlay to end of 1899-1900.	Actual percentage on direct Outlay on Works.	Percentage on direct Outlay on Works under the rules.	REMARKS.
1	2	3	4	5
<i>A.—Direct Charges.</i>	Rs.			
I.—Works (direct outlay)	2,04,90,162	100	100	
II.—Establishment	46,21,506	22.55	23	
III.—Tools and Plant	4,87,697	2.38	1.5	
TOTAL	2,55,99,365	124.93	124.5	
Deduct on account of receipts on Capital Account	36,188	...	...
Total, Direct Charges	2,55,63,177	124.75	124.5	
<i>B.—Indirect Charges.</i>				
Capitalization	5,92,228	2.89	3*	* This is an approximate figure. There is no fixed percentage but it usually varies from 2 to 3 per cent. depending on the locality.
Leave and Pension Allowances	8,17,663	3.99	3.22	
Total, Indirect Charges	14,09,891	6.88	6.22	
Grand Total, A and B	2,69,73,068	131.63	130.72	

APPENDIX IX.

IRRIGATION WORKS FOR WHICH CAPITAL AND REVENUE ACCOUNTS ARE KEPT.

Distribution of Works and Capital Outlay in the three Public Works Divisions of the Bombay Presidency (excluding Sind).

Public Works Divisions.	Number of Works.			Capital Outlay.			Percentage of Outlay in divisions on total Capital Outlay.
	Major.	Minor.	Total.	Major.	Minor.	Total.	
1	2	3	4	5	6	7	8
				Rs.	Rs.	Rs.	
Central Division	7	12	19	1,73,54,467	37,52,673	2,11,07,140	80.18
Southern „	1	14	15	8,64,892	35,55,317	44,20,209	16.79
Northern „	1	1	2	5,17,838	2,78,367	7,96,205	3.03
Total, Deccan and Gujarat	9	27	36*	1,87,37,197	75,86,357	23,23,554	100.00

* Three works under construction and one in abeyance are omitted.

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Particulars of Irrigation Works in Operation

No.	Name of Work.	Year in which Work first came into operation.	Area at present estimated as annually irrigable by the Works in column (2), 1899-1900.	Area irrigated during		Estimated value of Crops.	
				1898-99.	1899-1900 (Famine year).	1898-99.	1899-1900.
1	2	3	4	5	6	7	8
	<i>Central Division.</i>		Acres.	Acres.	Acres.	Rs.	Rs.
1	Nira Canal . . .	1885 . .	113,280	4,360	27,200	12,65,777	20,08,095
2	Mhasvad Tank . . .	1885-86 .	24,300	6,101	13,656	1,10,193	3,34,393
3	Lower Panjhra River Works.	1865 . .	12,627	3,593	2,458	73,782	17,283
4	Kadwa River Works .	1878-79 .	14,637	2,659	2,520	59,445	45,612
5	Lakh Canals . . .	1868 . .	11,280	979	1,053	12,310	7,040
6	Mutha do. . . .	1873 . .	16,800	8,045	8,725	10,92,399	7,35,657
7	Ekruk Tank . . .	1871-72 .	16,941	3,864	4,994	1,06,508	2,22,527
8	Hartala do. . . .	1875-76 .	415	30	4	433	30
9	Mhasva do. . . .	1877-78 .	1,700	218	899	3,525	14,945
10	Jamda Canals. . . .	1866 . .	5,000	2,585	4,615	29,484	52,821
11	Parsul Tank . . .	1889-90 .	1,000	550	172	9,846	5,683
12	Ojhar Canals . . .	1874-75 .	14,763	5,472	3,701	64,462	33,898
13	Bhatodi Tank . . .	1871 . .	12,124	743	870	25,680	17,571
14	Matoba do. . . .	1878-79 .	3,250	2,139	1,211	61,020	61,241
15	Kasurdi do. . . .	1869 . .	150	189	...	2,149	0
16	Shirsuphal do. . .	1878-79 .	1,800	1,190	400	88,933	39,050
17	Bhadalvadi do. . .	1881-82 .	2,000	1,808	826	88,578	59,384
18	Koregaon do. . . .	...	1,050	247	312	2,965	2,069
19	Ashti do. . . .	1881 . .	11,780	1,316	6,023	10,846	1,50,077
	<i>Southern Division.</i>						
20	Krishna Canal . . .	1869 . .	12,320	3,970	6,511	5,35,129	5,75,485
21	Rewari Canal . . .	1866 . .	1,920	1,567	162	94,486	27,892
22	Upper Man River Works.	1872 . .	2,080	1,570	1,781	22,979	54,025
23	Yerla River Irrigation Works.	1868 . .	5,480	3,859	4,126	49,567	1,60,040
24	Chikhi Canal . . .	1870 . .	1,478	468	45	29,769	3,800
25	Maini Tank Canal . .	1875-76 .	4,625	1,551	1,998	43,699	45,410
26	Muchkundi Tank . .	...	15	4	64	129	1,087
27	Nilgund do. . . .	...	0	0	0	0	0
28	Gadikeri do. . . .	...	337*	337*	387*	0	0
29	Dambal do. . . .	1879-80 .	1,000	{ 171	239	11,514	19,827
30	Medleri do. . . .	1884-85 .	600	{ 144*	144*		
31	Madag do. . . .	1865-66 .	1,345	833	1,314	41,448	74,066
32	Asundi do. . . .	1884 . .	1,011	{ 180	173	6,349	6,229
33	Mavinkop do. . . .	1881-82 .	617	{ 185*	185*		
34	Gokak Canal, 1st Section, and Storage Works.	1884-85 .	7,200	6,455	8,424	20,156	24,887
	<i>Northern Division.</i>						
35	Hathmati Canal . . .	1873-74 .	8,000	4,279	110	1,87,360	1,210
36	Khari Cut . . . .	...	3,000	2,805	0	80,335	0
	TOTAL . . .	...	316,425	130,849 1,206*	104,624 1,206*	42,40,228	48,15,824

DIX X.

in Bombay (Deccan and Gujarat).

Mr. M. Vis.
vesvaraya.

20 Dec. 01.

Capital Outlay to end of 1899-1900.	Percentage of net Revenue on Capital Outlay to end of year, based on Assessments.		Maximum area irrigated in any one year between 1886-87, or date of opening and 1899-1900.	Capital Outlay per Acre of maximum area irrigated per column (12).	REMARKS.
	1898-99.	1899-1900.			
9	10	11	12	13	14
Rs.					
56,83,300	0.87	1.50	47,574	119	Is comparatively a new work, but most promising, as the experience of the year 1900-1901 has shown.
20,75,411	0.26	1.26	13,656	152	Water stored to full designed height since 1898 only.
4,68,616	2.33	1.98	3,868	121	Storage tank ensures old irrigation. Supply not reliable for extending perennial irrigation to new areas.
7,52,217	...	...	3,403	221	Waste weir of Waghad Tank incomplete and water not stored to full designed height.
3,71,891	...	...	1,674	222	Storage works required for high class cultivation. Black soil unfavourable for extending dry-crop irrigation.
66,62,646	2.66	3.11	14,061	474	Lake Fife provides the storage for water-supply to Poona City and Cantonment. Rabi irrigation is limited, depending on the perennial crop area for which water is required.
13,40,386	0.90	1.52	4,994	268	Canals are single-banked and being frequently silted are expensive to maintain and do not carry their full supply.
73,382	0.87	0.51	249	295	Catchment insufficient. Tank does not fill every year.
1,38,956	...	1.22	899	154	Tank too large for catchment and available rainfall.
10,41,069	...	...	5,174	201	Storage works required for perennial irrigation. There is not much demand for water for rabi or monsoon crops.
2,14,995	0.51	...	822	262	The tank is new and of limited utility.
3,30,275	...	...	6,868	48	Storage works required; not much demand for water for monsoon or rabi crops.
3,79,707	1.37	...	1,720	221	The tank runs dry in or before April as a rule and there is no irrigation till the monsoon begins.
2,01,422	4.09	4.72	2,883	71	Is a promising little work fed by the Mutha Canal.
45,590	...	...	245	186	} Supply small and limited. Unreliable in seasons of drought.
2,24,568	...	...	1,753	129	
2,27,422	0.51	0.09	1,895	120	
39,189	...	...	429	91	
8,36,098	...	1.12	6,023	139	Dam constructed of bad material and not quite secure.
8,64,892	3.70	4.70	6,564	132	Storage works required and are under consideration.
59,811	9.26	1.55	1,877	32	Catchment small. Storage works required.
4,30,696	0.10	...	2,022	213	Supply deficient. In a year of drought the Pingli Tank does not fill.
7,04,892	0.62	0.53	4,126	171	The Nehr Tank does not fill in a year of scanty rainfall.
57,442	1.91	...	628	92	Work small and of limited utility.
3,89,649	...	0.73	1,998	195	Catchment small and rainfall insufficient.
1,58,707	0.06	0.31	205	774	The tank never fills owing to restricted catchment and scanty rainfall.
9,027	...	0	0	0	} Works small and of limited utility.
9,279	17.67	17.91	377	25	
63,980	2.09	2.78	440	146	} Works small and of limited utility.
81,392	...	0.07	145	561	
1,67,598	0.21	0.89	1,314	128	Rainfall good in the neighbourhood. Not much demand for irrigation.
74,995	4.11	...	211	355	} Works small and of limited utility.
30,847	6.02	6.60	546	56	
13,17,002	2.17	2.48	8,424	156	Is a promising work, yet young and undeveloped.
5,17,838	0.73	...	5,890	96	} Storage works required.
2,78,367	5.67	...	3,126	89	
2,63,23,554	1.23	1.46	1,55,581	169	

Mr. M. Visvesvaraya. Note on Establishment Charges prepared by Mr. Beale, Superintending Engineer on special Duty, for the information of the Irrigation Commission, 1901-1902.

20 Dec. 01.

Mr. Visvesvaraya's memorandum of November 1901, referred to in the Report, contains a note on the classification of Irrigation Works (Appendix VI) and a summary of Account Rules for regulating Establishment and other Charges (Appendix VII).

The following remarks may be found useful:—

In Government of India, Public Works Department Resolution No. 859—C. W. I., dated 26th July 1901, the Irrigation in India in 1899-1900 was reviewed. (Republished in the *Bombay Government Gazette* of 31st July 1901). In this review it was shown that the Major Productive Works for all India have been constructed from Loan Funds, and from Revenue in the proportion of about 5 to 1, while the other works: Major Protective, and all Minor, are constructed from Revenue. In Bombay the Minor Works for which only Revenue Accounts are kept are termed 2nd Class Irrigation Works. As regards Minor Works for which neither Capital nor Revenue Accounts are kept (Agricultural Works) they are apparently of most importance in Madras. It is stated at the end of paragraph 18 of the review: "Important as are those works in the aggregate it is hardly possible to determine what share of the revenue dependent on them is due to the expenditure incurred by Government on their upkeep, and on this account continuous Revenue Accounts have not been maintained."

In Appendix VII of Mr. Visvesvaraya's memorandum, paragraph 3, the following may be substituted for the last section:—

A Provincial district carrying out Irrigation Works charges 23 per cent., provided the Superintending Engineer belongs to the Provincial Establishment. If he belongs to Imperial Establishment (as in the Central Division) the charge is only 20½ per cent.

An Irrigation district carrying out Provincial Works charges only 18 per cent., provided the Superintending Engineer belongs to the Provincial Establishment. If he belongs to the Imperial Establishment, the charge is 20½ per cent.

For further details reference may be made to Government Resolution No. 1903, dated 14th December 1894, quoted in the margin.

The Secretary to Government of India, Public Works Department, No. 98-A. I. of 17th August 1884, concurred with the views expressed by the Government of Bombay as follows:—

Bombay Government Resolution No. 66-A. I.—229 of 1884, dated 26th May 1884, enunciated two rules:—

- (1) the costs of all establishments employed primarily for purposes of Revenue Maintenance should be debited to Revenue Maintenance;
- (2) concerning division of charges on other establishment debitable to Revenue Account:

In Sind (except in a few cases where special establishment has been engaged for Revenue Management), the whole Public Works Establishment under Direction and Executive should be debited to Maintenance, as the Department is not concerned with assessment and collection of Revenue.

Similarly in a few cases in Gujarat and Deccan where the Revenue Management still rests with the people, or the Revenue Department. But for new works, 25 per cent. on the actual outlay should be charged for Establishment on Maintenance and Repairs and the balance debited to Revenue Management.

The charges for collection by Civil officers are as follows:—

- (1) Works for which the assessment papers are prepared by Public Works officers, but collection is made by Civil officers—5 per cent. on realizations.
- (2) Works for which assessments and realizations are made by Civil officers—10 per cent. on realizations.

The charges for collection by Jagirdars is 7 per cent. if Jagirdars make collections only, and 10 per cent. if measurements for assessment are also made by them.

Note.—In the case of the Ashti Tank in Sholapur an allowance is regularly paid in cash to Jagirdars by this Department for collection of the assessment of Public Works officers. The amount collected is therefore, deducted from the total revenue realized when calculating the collection charges to this project.

• Some percentages are quoted in the accompanying statement, calculated from the figures given in the "Abstract of Expenditure" on the various classes of works for Bombay, for the year 1899-1900.

The charges are all authorized by Public Works Rules, and where the percentages appear wrong the matter depends upon some detail of expenditure, on which the proportion is different.

The 18 per cent. Establishment Charges shown against each district is the Executive Establishment only. Under "Examiner's Auxiliary Accounts" the 5 per cent. charges are made for S. E., Secretariat and Accounts. Expenditure on land compensation and similar things are exempted from Establishment Charges—*vide* Public Works Code, Volume II, paragraph 2119, Rule IX. When such expenditure is incurred, the percentage figures will be affected.

Sometimes there is a charge for Establishment and no expenditure shown. This is, because Imperial Irrigation Districts charge 12 per cent. to "Incorporated" and "Excluded" Local Funds and the remaining 11 per cent. to Provincial Civil Works on account of outlay carried out from both Local Funds. This also explains the excess over 18 per cent. in Nasik and Nagar. There is also a charge of 5 per cent. on Provincial Revenue in Nagar and and Nasik.

Examples:—

SATARA DISTRICT.		POONA IRRIGATION DISTRICT.	
43.—Imperial Irrigation Minor Works—First Class—Revenue.		45.—Provincial Works.	Civil
	Rs.		Rs.
Extensions and improvements	6,467	Original Works	6,926
Repairs	8,936	Repairs	7
	15,403		6,933
Establishment, 18 per cent.	2,772	Deduct outlay exempted	2,066
Special Revenue Establishment	2,164		4,867
Share of Subordinate Establishment employed on Revenue Management	609	Establishment, 18 per cent.	876
	5,545	Do 6 per cent. on excluded Local outlay.	3
			879
viz., 36 per cent. on Expenditure.		viz., 12.67 per cent. on Expenditure.	

Statement showing percentage charges for Establishment on the various classes of work in each district for 1899-1900.

NOTE.—The charges on Famine Relief Works (Imperial) are for the actual establishment exclusively employed on such work. There is no percentage charge for Superior Establishment and the figures, which vary from 0 to 15.44, but are generally very low, are omitted from this statement.

PROVINCIAL DISTRICTS.										IMPERIAL IRRIGATION DISTRICTS.			IMPERIAL DISTRICTS.													
WITH PROVINCIAL SUPERINTENDING ENGINEER.			WITH IMPERIAL SUPERINTENDING ENGINEER.			WITH PROVINCIAL SUPERINTENDING ENGINEER.				WITH IMPERIAL SUPERINTENDING ENGINEER.		WITH PROVINCIAL SUPERINTENDING ENGINEER.		WITH IMPERIAL SUPERINTENDING ENGINEER.												
Surat and Broach.			Kaira.		Ahmadabad.		Sholapur.		Bijapur.		Total average including Examiner's Auxiliary Accounts.		Satara.		Belgaum.		Khandesh.		Poona.		Dharwar.		Nasik.		Ahmednagar.	
1			2		3		4		5		6		7		8		9		10		11		12		13	
45.—Provincial Civil Works			158.24		67.93		146.56		53.28		...		28.63		69.25		{ No Expenditure. { Charge . 235 }		{ 12.67 { Charge . 40 }		{ 25.19 { Charge . 40 }		{ 25.19 { Charge . 40 }		{ 25.19 { Charge . 40 }	
45.—Incorporated Local Fund Civil Works.			11.26		10.33		11.99		12.05		...		11.95		11.90		1.61		...		...		11.93		11.23	
45.—Excluded Local Fund, Deposits, contributions.			{ 12.08 { Charge . 1,231 }		{ 7.16 { Charge . 1,231 }		17.24		{ 13.49 { Charge . 264 }		{ ... { Charge . 264 }		4.53		4.33		17.43		0.34		12.20		3.53		{ Rs. { Expenditure . 3,940 { No charge.	
45.—Ordinary Contributions			...		0.65		...		{ Expenditure 264 { No charge.		...		5.94		{ Rs. { Expenditure 2,319 { No charge.		Expenditure . 95. No charge.		9.17		{ Rs. { Expenditure 1,556 { No charge.		4.76		...	
45.—Imperial Civil Works			17.98		4.44		15.05		17.85		...		14.56		18		17.96		17.97		11.51		18.05		15.19	
Barrack Department (Separate Budget).			18		17		17		...		...		17.5		18		{ Expenditure 33.4 { No charge.		{ 23.56 { No charge.		17		17.7		15.5	
44.—Imperial Military Works			...		...		...		...		(22.9)		...		...		11.2		17.9		...		19		18	
35.—Imperial Protective Irrigation Works.			...		...		...		...		...		...		...		...		...		...		...		...
43.—Imperial Irrigation Minor Works—			...		...		{ Expenditure 7 { No charge.		...		...		...		...		...		17.8		...		17.63		...	
1st Class { Capital			...		19.02		{ Expenditure 45.9 { No charge.		...		...		36		19		77.9		61.59		96.7		...		415.6	
Revenue			...		13.3		...		16.76		...		...		17.95		69.7		36.21		69.1		11.4		...	
2nd Class, Revenue			21.7		17.76		...		17.96		...		...		...		...		...		...		...		...
Agricultural Works			18		3.6		58.01		2		...		22.3		{ Rs. { Expenditure 1,200 { Charge . 59 }		30.3		82.25		{ 600 { Expenditure . 4 { Charge . 2.4 }		34.18		198.28	
43.—Imperial Irrigation Major Works—			...		...		...		...		...		...		...		...		...		...		...		...
Working Expenses			...		22.3		63		...		...		37		...		91.6		76.3		...		149.26		397.87	
43.—Provincial Irrigation Minor Works (Gokak).			...		...		...		...		...		...		...		...		...		...		...		...

Mr. M. Vis- 1. Q. (The President.) You are the Executive Engineer
vesvaraya. for Irrigation, Poona?—Yes.

20 Dec. 01. 2. Q. How long have you held that position?—For
two years and eight months.

3. Q. Where were you previous to that?—I was attached
to the office of the Superintending Engineer, Central
Division.

4. Q. What are your duties here?—I have charge of
the Mutha and Nira Canals including their storage reser-
voirs, four small tanks, two or three famine works, and
the water-supply of Poona and Kirkee cantonments.

5. Q. You say, "The culturable area commanded by the
works is 289,981 acres or about 12 per cent. of the total
culturable area of the district. There is room for further
extension, especially in the northern half of the district."
How much do you estimate of the culturable area is actually
cultivated every year?—Nearly the whole area is cultivated;
the cultivation by means of irrigation is, however, only about
60,000 acres. The rest is on rainfall.

6. Q. You say there is room for further extension,
especially in the northern half of the district—what
extension do you contemplate?—There are a number of
small rivers on which reservoirs may be built. In the
north-eastern portion of the district, irrigation might be
practised from storage reservoirs, constructed near the
ghāts. The whole area would want a systematic exam-
ination.

7. Q. With reference to what you say about there being
room for further extension, is that from personal know-
ledge?—No, not entirely; that is my general impression
formed in my tours in the northern part of the district.
No surveys have been made except a very long time ago;
probably about 25 years ago.

8. Q. You say in your note, "the reason of more
favourable results in this district is that large storage
works, which have an unfailing ghāt supply have been
constructed in combination with canals which reach down
to tracts of scanty or uncertain rainfall." You refer here
to the Kharakwasla?—Yes and the Nira Canal also.

9. Q. Do you know whether in this district any other
surveys have been made?—We have recently made surveys
in the river valleys in four places. Mr. Beale has the
results of the preliminary surveys. We have prepared rough
estimates for works costing about 60 lakhs of rupees.

10. Q. What manner of works are these?—Three out of
the four are works of a productive nature; that is, they
would be worked for growing high-class crops.

11. Q. Do they depend on reservoirs?—Yes.

12. Q. Where are they?—On the Pauna and the Mutha
rivers in the ghāt region and the Kara river on the plains.

13. Q. These projects are to strengthen the Mutha Canal?
—Partly; two of them are intended for that purpose.

14. Q. What is the discharge on the Mutha Canal?—It is
not more than 250 cubic feet per second; we propose to
increase it to about 500 cubic feet per second.

15. Q. What is the discharge from the Nira?—About
450 cubic feet per second; we propose to increase it to over
700.

16. Q. Then you have not a general scheme for the whole
district?—No; there is a lot to be surveyed before a general
scheme can be formulated.

17. Q. Do you find the people on the Nira Canal ready
to take water always?—They are ready now. Before 1898,
there was more water than there was demand for. That
was due to sufficiency of rainfall; we may be returning
to the same state of things again. If there is a good rainfall
there will not be much demand for dry crop irrigation. On
the Mutha Canal we have no water to give for *rabi* crops.

18. Q. If there is good rainfall, say up to the end of
September, then you would start the *rabi* crops?—Yes.

19. Q. Without irrigation?—They almost always sow on
rain, except in a year of drought. They wait for rain. If
the rainfall is insufficient they ask for canal water. In
one year out of three they get enough rain for a fair
guar crop.

20. Q. When?—From September to November..

21. Q. (Mr. Muir-Mackenzie.)—Is it necessary to get
the November rains in order to get a good crop?—Yes, or at
least at the end of October. If the later rain fails, they
require water from the canal.

22. Q. Without the water could they not get any crop?—
That depends on the character of the rainfall. If the
quantity or distribution of rain be insufficient or unsatis-
factory, the crop will be very inferior.

23. Q. In a good year you would reckon on the October
rainfall?—Yes.

24. Q. The later the rainfall the better the crop?—
Early rain is also necessary for sowing. If the late rains
fail, they always use canal water.

25. Q. (The President.)—You say, "Where there is
chronic deficiency of rainfall there is demand for water
every year on black soil also?"—Yes, in the eastern parts
of this district.

26. Q. Do you mean even in ordinary years?—Yes;
under the small tanks in the eastern or dry parts of this
district, there is a demand for water in the *rabi* season
every year.

27. Q. Although it is black soil?—Yes, if they get
good rain they prefer to raise the crops on rainfall; other-
wise they fall back on the canal.

28. Q. You say it is no disadvantage to have black soil
where the water-supply is perennial, you mean for sugar-
cane?—Yes and even for dry crops in the drier tracts.

29. Q. Do they grow sugarcane freely?—Yes, but the
black soil wants a lot of manure.

30. Q. You say, "the rivers and streams in the northern
part of the district are suited for extension of irrigation
to that region." You know the soil in the northern part?—
Yes; it is lighter than in the south.

31. Q. Therefore it will take irrigation more freely?—
Yes.

32. Q. Is there any proposal for a survey?—A long
time ago surveys were made, but when they took up the
Nira, they probably thought they had done enough for
the district.

33. Q. There are no Provincial Works?—No. None.

34. Q. Have the villagers never been in the habit of
making irrigation tanks?—Not in recent years.

35. Q. There are no ruins of old tanks?—There are
some small tanks used for water-supply or washing, by men
and cattle.

36. Q. In some parts of the Bombay Presidency there
are tanks in every village?—That is not the case here.

37. Q. (Mr. Muir-Mackenzie.)—Have you served in
Gujarat?—Yes. I was in Surat.

38. Q. (The President.)—Comparing the soil here and
in Gujarat, I suppose there is more black soil there than
here?—Yes, but the soil here does not crack as in Gujarat.

39. Q. Do you know anything of the Tapti valley
scheme?—I have heard of it. I think a scheme of that
magnitude should be given a trial notwithstanding the
black soil. No chance has been given for such works in
Gujarat yet, on a large scale. I do not see why we should
not construct a large canal.

40. Q. You say, "enquiries show that during the drought
of 1899-1901 the water-supply of wells ran short. Do you
know how long it took to run short, did it begin to break
down in the first dry year?—I think it first broke down at
the end of 1899 or beginning of 1900. I was not here in
1896; 1897 and 1898 were fairly good years.

41. Q. Have you ever thought as to whether it was
necessary to require applications to be made every year
for water. Is it not a discouragement to the cultivator
to go through all the necessary formalities?—In the
case of the small tanks I think water applications should
be dispensed with; on large canals, this cannot be done.
In the monsoon we stretch a point and allow cultivators
to take water. There is a Government Resolution which
permits the watering of dry crop in the monsoon before
accepting water applications.

42. Q. Is there any use in the application system?—
It is of great use after the monsoon, for dry weather and
perennial crops, when the water-supply is limited.

43. Q. What advantage do you attach to it?—It prevents
our accepting responsibility for watering a larger area than
there is water for. We have to calculate for what area we
can give water. We cannot promise an indefinite amount.
We usually determine the supply available in November
after the monsoon and we find out for what area we
can give water and restrict the applications accordingly.
At the end of the monsoon we have a certain amount of
storage in the tanks which can irrigate a certain limited

area only. If everybody were allowed to take water, the water-supply would run out in the middle of the season and the crops would suffer.

44. Q. What are you afraid of if you give up the system?—For instance on the Mutha Canal we have about 3,000 million cubic feet of water ordinarily. The storage varies. If the later monsoon rains fail, wholly or partly, this storage is drawn upon earlier in the season, and there is the further disadvantage that the normal flow in the river stops earlier than in seasons of good rainfall. In a good year, therefore, the water-supply may suffice for 30 to 40 per cent. larger area than after an unsatisfactory monsoon.

45. Q. Does the supply vary very largely?—Yes, to the extent mentioned already; we raise the water above crest level by means of temporary standards and boards. That makes a difference of about 600 million cubic feet.

46. Q. In a year of drought you cannot depend upon having the Mutha reservoir full?—No, not to the top of the temporary weir crest. We store water at the end of the monsoon 2 to 4 feet above the crest of the waste weir by means of a temporary weir of standards and planks; whether the tank fills to the top level of the planks or not depends on the later monsoon rains. This also introduces an element of uncertainty in regard to the quantity of water available.

47. Q. Do you think that, generally speaking, you would get the full supply or not?—We are certain of the lake filling every year up to the top of masonry crest.

48. Q. Then when you begin the *rabi* irrigation in October and November you should be able to count upon a certain amount of water?—The difficulty is that if the later monsoon rains fail, there is no water in the river to speak of and we have to draw upon the storage earlier. We cannot be certain what storage will be available till about the beginning of December: that is our great difficulty. We have tried to work this out scientifically for the past two or three years. If we had failed to do this, there might have been extensive failures of crops by untimely failure of supply.

49. Q. Between what limits can you count?—The difference will be 20 to 25 per cent. between short and full storage; we cannot put up the planks early enough to make sure of a full tank because there is danger of heavy floods overtopping the plank weir and raising the storage to an unsafe level. If, on the other hand, the planks are put in late and the later rains fail there may be no replenishment in that season. These circumstances render the storage uncertain within the limits stated.

50. Q. The remedy is, I suppose, a supplementary reservoir?—Yes.

51. Q. If you had that supplementary reservoir could you count upon a fairly uniform discharge?—The uncertain conditions in that case will go lower down. Now up to Loni we have got a fairly satisfactory supply throughout the year, and if we build another reservoir, the limit will be shifted 12 miles further down, and beyond that limit the uncertainty will continue. The fact is we want very much larger storage than we have at present.

52. Q. Are you aware that on the great canal systems of Northern India no applications are ever asked for?—The villagers send up applications on the Sone Canals.

53. Q. I am talking of the Punjab and North-Western Provinces?—I am not aware of the conditions there.

54. Q. The village gets a certain number of sluices and the people work them; they distribute the water and there are no applications?—We cannot do that here; our water is too valuable except in the monsoons when the rivers are full. Our storage at other times is very expensive.

55. Q. You say in your Note, "Irrigation works get no credit for increase of land revenue." Is that the case?—Yes.

56. Q. Is not an owner's rate charged on land?—Not in the Bombay Presidency.

57. Q. There is a book credit given to the canal, is there not?—Not on the new capital account works.

(Mr. Muir-Mackenzie.)—The land is not assessed wet on Government irrigation works. The water rate is kept quite distinct from the land revenue. In theory the canal gets all the credit it deserves, though in practice it may not get all. There may be some enhancement made owing to the increased security.

58. Q. (The President.) Then the canal does not get full credit for what it does for the country?—It does not.

59. Q. (Mr. Ibbetson.)—Does not the introduction of a canal bring new land under cultivation?—(Mr. Muir-Mackenzie.)—No, only the cultivation of old land is rendered more secure. There is only one per cent. waste even where there is no canal. If credit were given I think it would only increase book complications without any material addition of revenue to the canal.

Witness.—Neither could we guarantee the water-supply every year for irrigating the whole area now classed as irrigable.

60. Q. (The President.)—If you have sufficient storage reservoirs?—In that case, we can guarantee to the extent of the storage only; it depends again on the nature of the crops.

[The President.]—It seems very important for the Bombay Presidency that all credit should be given to canals.

Mr. Muir-Mackenzie.—It would complicate accounts, without, I think, much advantage to the canals.

Witness.—(Continuing) You say, we might give water permanently without applications; what rate would you fix?—(The President.) Rs. 3 an acre for wheat.

Witness.—Our working expenses amount to about Rs. 3-8, so it would not pay if the crop rate was only Rs. 3 per acre. We have a net revenue now of over Rs. 3,50,000.]

61. Q. I don't quite understand your point?—The more you extend irrigation the more you lose; our revenue depends on the nature of crops more than on the area. A large extension of low-rated crops is a disadvantage from the point of view of revenue.

62. Q. I don't yet see your point?—Would you charge by the quantity of water or the area irrigated?

63. Q. By the area?—There would be the difference of Rs. 2 and Rs. 40 per acre that I spoke of.

64. Q. Would you say to a man if he asked for irrigation for a dry crop, I cannot give you water because there is so much required for sugarcane?—The water-supply is hypothecated for a certain area and only the balance is available. If every one were allowed to take water as he chose the supply would run short. In Northern India they admit as much water into the canal as they can and they prefer wasting it down the canal where there is a chance of some of it being used to allowing it to run to waste in the river itself; here in Bombay we try to draw from our storage reservoirs as little as would just meet our wants because the water-supply saved is reserved for future use.

65. Q. In Northern India it is true that the rivers have a large discharge, but it varies and the supply in the canal is often insufficient?—There, I think, more than three-quarters is dry crop; here we have to regulate the amounts; one million cubic feet will grow $1\frac{1}{2}$ to 2 acres of sugarcane; for the *rabi* crops it will be 12 to 15 acres.

66. Q. Do the people that are growing sugarcane have to send in applications?—Yes; the sowings begin in February and go on into March and April; we calculate what supply will be available; we only take applications to the extent that we have water for.

67. Q. Don't you think it possible to bring down your working expenses?—We cannot in the case of high-rated crops.

68. Q. Your working expenses are enormous compared with Northern India?—I don't think so, our crop rates also are very high; compared with the capital cost of the works our charges are moderate.

69. Q. (Mr. Muir-Mackenzie.)—Our present working expenses are so much disguised by the system of accounts that it is impossible to get at them.

Witness.—Will you please refer to page 12 of my Memorandum about the system of accounts in this Presidency; we can manipulate the area; for instance, we could check the area under sugarcane and increase that on *rabi* crops—one acre of sugarcane is equivalent to about eight acres of *rabi* crops; on the Mutha Canal, by refusing water for cane we could irrigate 40,000 acres instead of the 8,000 acres at present.

70. Q. (The President.)—Which is the best way of protecting the country against famine?—I think working on "productive" lines; we should not look up water on the chance of a famine; we should every year make an estimate of the water available for high class crops, and in famine years make some concession in favour of dry crops; please see page 17, section 9 of my Memorandum. Another point, in this Presidency, is that we have about 300,000 acres, which are estimated to be irrigable, but we only work up to 100,000. In other Presidencies almost up to their maximum.

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71. Q. It comes to this, that in the famines, which do unfortunately occur, Madras and the Punjab can protect themselves but Bombay cannot on account of the system followed?—I consider that water should not be reserved to a large extent for dry crops in a famine year because it would disorganize the cultivation of high class crops; I had much rather have a fixed area of high class crops from year to year than reserve water for dry crops for which the demand is slack in ordinary years, and only becomes keen in years of drought; my proposals on this point are explained in section 9, page 18 of my Memorandum.

72. Q. By 'fixed area' you practically mean sugarcane?—Yes, and garden crops; also a certain proportion of cereals and other crops.

73. Q. You begin to irrigate sugarcane in March?—Yes about February and March.

74. Q. If you have a fixed area of sugarcane you don't know in March if there is going to be an early monsoon, and if the monsoon fails on the 1st of October and the tanks get dry, what would you do?—Our *ghat* reservoirs fill every year. We would only guarantee one-third of the area for which there is water. In ordinary years I would allow people to have cane under wells, but would not guarantee them water after October. That is the "permissible" area.

75. Q. Your 'fixed' area would be strictly limited?—Yes, otherwise the water-supply may fail.

76. Q. Is your "permissible" area just what is over and above the "fixed"?—I should like to refer you to section 9, page 17 of my Memorandum.

77. Q. As regards the "permissible area," if a man were to come and say—I want to start my sugarcane now and am prepared in November and December to go on with my well, would you make him pay less?—Yes, certainly.

78. Q. (Mr. Ibbetson).—You say in a famine year you would refuse water to "permissible" cane and keep two-thirds for dry crops, but a man gives in his application in March, and you don't know till August how things will be?—I would accept his application conditionally on the water-supply being liable to be withdrawn if necessary in October.

79. Q. Do you restrict the area of sugarcane in a dry year?—Yes; we don't accept applications freely.

80. Q. How do you know in March or April that it is going to be a dry year?—We accept applications in March and we calculate the area for which we want water up to the end of June, and issue passes accordingly. If we tide over the hot weather we have ample supply in the monsoon. After the monsoon also we usually have sufficient supply for bringing to maturity crops sown in the previous hot weather. If the monsoon rainfall is good and the tanks are full, we may give water to the area which I have classed as "permissible". If the water-supply is short, the permissible area will be refused water and will have to fall back upon wells. The "fixed" area will get water till March following.

81. Q. (The President).—Is there much scope for extension of irrigation?—Yes; but each work is judged by its direct productive value and if this is unsatisfactory the Government of India will hesitate to grant funds, no matter how strong the recommendations of the Commission may be. Sound finance is the test of success in irrigation as in every other public department and our first concern should be to show a good return. In order to enable us to show a good return we want to work our system on lines suited to local conditions and not on those laid down for other conditions in the North-Western Provinces and Punjab. Financial considerations are everything.

82. Q. We would not be here if financial considerations were everything. Don't you get as much money as you require for the maintenance of canals?—It is stinted.

83. Q. Do you mean for construction of new works or maintenance of existing works?—Both—(paragraph 8, page 1 of Memorandum read out.)

84. Q. That is for construction; are you stinted for maintenance?—The reduction in expenses on maintenance began with the abolition of the office of Chief Engineer and special Executive Engineers for Irrigation; from about 1885 the annual outlay, both for maintenance on old works and for new works, has been very low and the tendency has been towards severe economy.

85. Q. You have got works which are not paying at all?—My works in this district pay fairly well; they results in the Presidency, because they are

86. Q. Do you consider that by spending more money you could get a greater return?—Yes, by increasing the scope of the works. For instance, the discharging capacity of the Mutha Canal may be increased from 250 cusecs to 500.

87. Q. Would the expenses of maintenance be doubled?—No, they would not be in the same proportion. If we provide more storage and work more on productive than on protective lines will our works pay. The more storage we have the more will our works pay. I guarantee that if I am given a chance to work the Nira Canal on our own lines, we will make it pay the full interest on the capital outlay; but there are two things necessary: we must be given more money and allowed to work on our own lines.

88. Q. In what way have you been hitherto restricted?—The tendency of the orders of the Government of India has been in that direction (paragraph 3 of Resolution No. 53-1., dated 9th March 1893, by Government of India, read out as in paragraph 3 of Memorandum.)

89. Q. (The President).—Does the Government of India restrict you as to the amount you must use for sugarcane?—

Mr. Muir-Mackenzie.—Yes.

Witness.—Yes, and I have to lock up water in expectation of its being utilized for other crops every year.

90. Q. (Mr. Ibbetson).—You would look to returns rather than to area?—Yes; good returns are an indication that valuable crops are grown and the locality steadily benefits by the irrigation work.

91. Q. (Mr. Muir-Mackenzie).—The Government of India say that certain works are to be productive and certain protective. The Nira is a protective work and we can only give a limited quantity of its water for perennial crops after reserving sufficient to irrigate a reasonably large area under dry crops in a year of drought.

92. Q. (The President).—As a result of the system you follow you may have water locked up?—Yes, at the end of the year water may remain unused. If water is reserved for dry crops it may never be used in that particular season and may lie locked up till the next replenishment, or it may be run to waste.

93. Q. Simply because it was kept for dry crops?—Mainly because of that; we have never been able to use the whole supply for high-class crops although there was the demand.

94. Q. If there were no applications, not a drop would have been wasted, if the people had utilized it, taking all the water they liked?—If there are no applications and no control, the water-supply may run out in March or April, that is, in the middle of the season. We must control every part of the canal and regulate the flow in our canals according to the supply available; the circumstances are entirely different here to those in other provinces. We have a totally different set of conditions and we desire that we may be allowed to manage things in our own way.

95. Q. The question is to protect the country against famine?—I should place irrigation in the first line of defence for protecting the country in times of famine, but irrigation cannot entirely protect the country in such years. We must have irrigation works to the utmost extent possible but at a reasonable outlay.

96. Q. You say in paragraph 20, page 5 of your Memorandum, "in good seasons the black soil of the Deccan yields a full harvest and in ordinary years a fair harvest;" I suppose there is great variety in the black soils?—Yes, there is a great variety.

97. Q. In some places more than others they take irrigation?—Black cotton soil is the worst for irrigation; it cracks; other classes of black soil which are mixed with sand or have a murum sub-stratum are favourable, especially for sugarcane.

98. Q. Do you know of what proportion of the Deccan black soil one might say that it cannot be irrigated at all?—A very small proportion. On all kinds of black cotton soil if there is a chance of good rain, it pays the people to raise food crops and cereals on rainfall rather than on canal water. Irrigation from canals can be carried on with profit for growing all crops which cannot grow on rain alone. We found at Ahmednagar, where the soil is black, they take water, but at Surat and Broach under no circumstances will they take it?—I think that there is more sand in the Ahmednagar soil. Surat soil is inferior for purposes of irrigation.

99. Q. I see you say in paragraph 23, page 5, "during 1895-96 the area irrigated in the Deccan and Guzarat was 74,923 acres and the assessed revenue from water-rates amounted to Rs. 4,52,476. During 1897-98, though the area rose to 126,516 acres, the revenue amounted to Rs. 4,33,139 only, so that with an increase of 69 per cent. in area the increase in revenue was about 9 per cent. only?"—1897-98 was practically a famine year and there was famine in the previous year. People were anxious to replenish their store of grain and there was an extension of dry crop irrigation.

100. Q. The Maswad and Ekruk tanks cannot, I suppose, be connected with the *ghāts*?—I think not the Ekruk; an attempt might be made with the Maswad; the question should be investigated.

101. Q. You say on page 8 in paragraph 6, "the formalities of the water applications and special measurements, etc., are also obstacles in the way of extensions of irrigation"; you proposed the "fixed" area on that ground?—In order to enable us to dispense with water applications by crops, I have proposed "fixed irrigation" under my scheme. I propose to dispense with water applications entirely in the case of small irrigation works only.

102. Q. Would the "fixed area" be the same land every year?—It would be the same for six years and would then be changed. Under my scheme one-third of the water-supply will be given to the "fixed area" always; the remaining two-thirds will be given to the "permissible area" in good seasons and be applied to dry crops in seasons of drought.

103. Q. If a man held 300 acres he might without sending in an application grow sugarcane over 100 acres?—Yes, I should restrict the area under sugarcane to one-third of the total area of the blocks.

104. Q. He might grow it on any hundred acres?—Yes.

105. Q. He might change the field so long as he did not exceed the area?—Every village under command and which can be conveniently served by the canal should have one or two specified blocks to which irrigation should be confined; the people of the village must agree among themselves to practise irrigation in that block; people who have no land of their own may lease out plots from others, as is at present done, during the currency of the lease for water-supply. I should guarantee the water-supply for such blocks for six to seven years at a time.

106. Q. Don't you think six years too much?—No. We have sugarcane crop running six years without re-sowing. That is unusual of course; the usual custom is to have a *ratoon* crop for two or three years.

107. Q. (Mr. Muir-Mackenzie.)—Would you endeavour to make *phads*?—Yes; but people will do the distribution among themselves as they have done in Nasik and Khandesh; this point is explained in Mr. Beale's report.

108. Q. Within a certain area the cultivators would probably arrange their own rotation?—Yes. If we have a "fixed" area for which we guarantee water the people will lay out their money and manure their land; under the present system there is too much uncertainty.

109. Q. (The President.)—Would you bind them to take water?—This is explained in paragraph 55, sect. 9 of my note (read out.) The proposals I have made are, I think, under the present circumstances the best. If water were given to any and every part of a village there would be serious loss. With the same quantity of water we shall probably be able to irrigate 50 per cent. more area in the block than if the irrigation were in scattered patches. I admit there will be some difficulty in giving opportunities to all cultivators to irrigate, but they can arrange among themselves and obtain plots either in exchange or by lease as at present. At present cultivators from parts of the district where there is no canal irrigation bring their capital and obtain lease of plots of land for sugarcane cultivation. The same might be done in connection with the blocks. Sanction to grant a block may be withheld until the villagers agree among themselves to give a share to a reasonable proportion of the cultivators in the village. This seems to be the best possible system under existing circumstances, but if a better system is suggested we shall be glad to go into it and give it a trial.

The population of the Bombay Presidency according to the census of 1901 was 16 millions; the net cropped area is more than 19 million acres, giving a rate of more than 1 acre of cropped area per head of population. In all other provinces—vide Appendix I of my Memorandum—the rate per head is less than 1 acre. One reason why irrigation is not so extensively encouraged in this Presidency seems to be the large area cultivated compared with the population;

if they get a good crop once in two or three years they can afford to live on it. Mr. M. Visvesvaraya.

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Another point I wish to bring prominently to notice is the percentage of area of well irrigation on total cropped area; in Madras this percentage is 4.89, in Bombay it is 3.40, while the corresponding percentages for tank and canal irrigation are 19.50 and 0.70 for Madras and Bombay respectively. I think these figures show that adequate provision is not made in Bombay and that there is large scope for the extension of canal and tank irrigation in this part of the country.

I have said already that the proportion of cropped area to population is larger in the Bombay Presidency than elsewhere. Dry crop irrigation will not pay in Bombay; over 92 per cent. of the irrigation in Madras is under paddy or rice. If rice is excluded, other irrigation, including perennial, is small. Irrigation is mainly a question of rice cultivation in Madras. We have very little rice cultivation in the Deccan, because other food-grain crops like *juar* and *bajri* are grown on rainfall with less expenditure of labour and capital and less trouble than rice, which ordinarily requires irrigation in addition to rainfall.

110. Q. This country has suffered very much during the last few years from famine. Supposing you had reason to believe that in 10 years' time there would be another famine, what would you do for the Deccan before then?—Irrigation at the best will only be a partial remedy, but I should have works of several kinds—tanks fed by *ghāt* rainfall. I should also try large canals constructed like the inundation canals elsewhere taken from rivers fed by *ghāt* rainfall. These canals will have to be taken through rough country and will be expensive, but the expense must be faced. The water which is now running to the sea will be carried in these canals which in a year of drought will distribute moisture over the whole country; depressions along its course may be filled and tail tanks like those mentioned by Mr. Beale may be replenished; and subsoil water wherever such canals pass will be raised and well irrigation will be encouraged. The next class of works, though not the least important, are village tanks and weirs on small rivers; these may be largely extended. From this class of works Government should not expect a large revenue. If they did, there would be no progress, but the indirect results will more than repay the outlay on them. As suggested in my Memorandum 12 lakhs may be spent annually on irrigation works, 10 on large tanks and canals, and 2 on minor village tanks and river weirs. But the more money available the better.

111. Q. What works would you propose to spend it on?—It is important to have a proper hydrographic survey of the country first.

112. Q. That won't cost very much?—Only 1½ lakhs per annum, for the next 8 to 10 years; there will then be some excellent schemes. Meantime we can carry out reasonably good schemes already projected.

113. Q.—(Mr. Muir-Mackenzie.)—Why are you confident that the schemes will be excellent; you will remember that a large number of projects in connection with Lake Fife and the Maswad were prepared which it was thought would be excellent, but they were not so?—I would like a reference to paragraph 30 of my Memorandum, in which I have explained why the Deccan works were a failure. I have all along contended that if the works are managed on lines suited to local conditions they will show better results than they do now. I have admitted, however, that Bombay works will never be as remunerative as works in Northern India. I don't ask that expenditure in this Presidency should be anything like what it is in other provinces, but there should be a reasonable allowance made to this Presidency also, which there is not at present.

114. Q. How are you sure that the mistakes made in the past won't occur again?—I think we are wiser now.

115. Q. (Mr. Ibbetson.)—Why do you think in ten years these schemes will repay Government when the present schemes don't?—They will pay indirectly and they will pay also a reasonable direct return if the present anomalies and difficulties are removed.

116. Q. Do you think the present schemes do pay Government?—The Mutha pays more than 3 per cent. and the Nira about 2 per cent. and on the two, if indirect results are taken into account, the return to Government, if I may risk an estimate, is probably more than 6 per cent.

117. Q. (The President.)—Do you put as your first condition certainty of supply?—That certainty is always possible in reservoirs fed by *ghāt* rainfall.

118. Q. Having got your survey and knowing all about the country, where would you look for the first means of

Mr. M. Vis. security; would you look to the storage of the ghât supply? *vesvaraya*.—Yes, and then go to the plains.

20 Dec. 01. 119. Q. (Mr. Higham).—With regard to the new storage works on the ghâts I understand these are the only proposals made?—Yes, I have submitted rough schemes for four new tanks for this district.

120. Q. Are there any other possibilities of storage?—There must be several other sites. These are all that have been examined.

121. Q. Where?—In the northern parts of the Poona district. Also, the existing works the Nira and Mutha Canals, may be extended by increasing their storage by means of new tanks and by extending the canals and their distributaries.

122. Q. You can make more storage works than are shown here?—I think many more.

123. Q. Suppose you get a greater increase of storage tanks, could you use them?—We could if we work on the lines I have suggested now. We should extend the cultivation of crops which do not depend on rainfall.

124. Q. You would not extend your area of cultivation?—The total area may not increase; our cultivation in ordinary years should be intensive.

125. Q. I am speaking of this tract of the Poona district in which you have no irrigation; could you extend irrigation on that by finding more storage tanks in the ghâts?—I think so; no detailed surveys have been made; we have rough surveys made in some few instances showing that it is possible.

126. Q. Could you make a new branch to the Nira Canal and divert a portion of the supply to another part of the district, if you have a greater supply available at the head of the canal?—We can extend by taking a branch from the Nira Canal to Satara and Sholapur. Mr Beale has an idea of having a branch canal.

127. Q. Provided you get water?—Yes; storage must be first provided. Before we think of extensions, we should increase storage for the Mutha Canal in this district. The present canal is 70 miles long and half of it is not working. There is ample scope for using all the water we can store up in the ghâts.

128. Q. Could you command the north-eastern part of the district by the ghât tanks?—I believe so.

129. Q. What about the Bhima?—It is very low; it is very deep; but if we have a very high weir it may be possible to take water for irrigation from it; whether such a scheme is financially possible depends upon the result of surveys.

130. Q. What about storage?—We should probably have to store water near the ghâts and take water a long way in the rivers and raise where required by means of pick-up weirs.

131. Q. Can't you store up on the ghâts?—We can, sir, but no regular surveys have been made.

132. Q. I suppose no proposals have been made because the river is much below the level of the country?—Yes, that is the general impression. But we may be able to find sites for reservoirs though we shall have to go a long way to get command.

133. Q. Last year, 1900-01, you irrigated over 52,000 acres on the Nira Canal?—Yes; I can irrigate 100,000, if necessary. Area and the nature of crops irrigated should both be taken into consideration in estimating the results in any year.

134. Q. You irrigated 47,000 acres in 1897-98?—Yes.

135. Q. And 42,000 in 1896-97?—Yes.

136. Q. These were the largest areas?—Yes, in recent years.

137. Q. Were they all very dry years?—Yes; except 1897-98; when in order to replenish their stock of grain, the cultivators irrigated a very much larger area than usual; they did not wait for rain-water.

138. Q. What was your supply in 1897-98?—Our supply in the tanks was full.

139. Q. You had sufficient supply all through 1899?—No, in 1899, the Bhatphar Lake did not fill. We restricted our area and regulated our supply.

140. Q. This shows a much larger area because it includes a greater area of food crops and less of sugarcane?—Yes; the proportion of the sugarcane crop is only 10 per cent. on that canal.

141. Q. Of the normal area?—Yes, 10 per cent. of the normal area.

142. Q.—How much this year?—We have got the same area, about 6,000 acres of perennial crops. I have not got the figures for the first official year here, as the Revenue Report is not out.

143. Q. You do not know what it was?—No, I have got figures for other years.

144. Q. You had a very small area in 1892-93?—Yes the canal was young then, and not developed.

145. Q. In a wet year what is the effect on the area?—It will probably go down to 30,000 acres. If there is plenty of rain, water is taken only for perennial crops and a little perhaps for *juar*; some water is always taken for *rabi*.

146. Q. (The President).—Is there any rice at all?—No; very little.

147. Q. Not worth mentioning?—No.

148. Q. (Mr. Higham).—Does sugarcane come under *kharif* or under *rabi*?—Under *kharif* (explains from the book).

149. Q. Take 1898-99; you had 34,000 acres; you say it was mostly perennial?—No, it was not mostly perennial.

150. Q. (The President).—You put it too strongly when you said that in a wet year there would be nothing but perennial crops?—I mean that in a wet year $\frac{1}{3}$ ths of the revenue will be from perennial crops; that from the other crops would be very small, though their area may be comparatively large. But area alone is not a true index of the results. One acre of sugarcane is equivalent to 8 to 10 acres of dry crops.

151. Q. Under any circumstances would the area of perennial crops be more than 25 per cent? Never.

152. Q. (Mr. Muir-Mackenzie).—By your system you can raise it to a third?—Yes, in the blocks only. Outside the blocks, the dry crop area will preponderate.

153. Q. How much of your area would be perennial under your system?—About 10 per cent.; perennial crops would get $\frac{1}{3}$ rd of the water-supply, but one acre of cane takes as much water as 15 acres of other crops so the area would only be about $\frac{1}{10}$ th.

154. Q. (Mr. Higham).—You say, "we are not allowed to work on our own lines," who do you mean by "we"—the Local Government?—No, the Department.

155. Q. You are not allowed to work on your own system?—No, not in the manner we think best adapted to local circumstances.

156. Q. You attribute this to some orders of the Government of India?—Yes.

157. Q. What orders are they?—The Government of India have laid down a general policy for all the provinces.

158. Q. Where is that policy laid down? I do not see it here?—(Reads.) It is laid down here.

159. Q. You say this means that the canal is not to be worked for productive purposes.—That is what we generally understand.

160. Q. You say you are fettered by the Government of India. Where are the orders?—I do not say there is any specific order of the Government of India which applies to this Presidency alone, but the general impression of the Government of India is that where there is extensive irrigation that means protection. In our experience here protection does not mean production. Government have laid down general rules for all provinces, but they work badly here. We are guided by the rules and general policy of the Government of India.

161. Q. In this particular case the Government of India merely remark that in a season of drought there has been a decrease of area. It is usual to expect an increase of area in a dry year. It seems a harmless remark on which to base such an assertion?—But increase of area means in a large number of cases, decrease in revenue in the special circumstances of this Presidency.

162. Q. That remark may be made in regard to any canal in a season of drought. I do not see how you can construe it in the way you do?—For this reason; our water-supply in a year of drought is limited and we have to help the perennial crops of the previous year and provide water for a reasonable area of new sowings of the same class of crops. If water is diverted from these to increase the area of dry crops, irrigation of perennial crops would be disorganised. In this Presidency we ought to look to valuable crops rather than to extension of area.

163. Q. You have no other order to restrict your supply to protection of dry crops?—No direct orders. I think it is the impression of the Government of India that wherever

there is extension of area under irrigation there is protection. Protection means production elsewhere, but not here.

164. Q. Has your Public Works Department ever made any representation to Government on the matter?—I think so. I cannot say definitely what they have done, but they must have represented the difficulties several times.

165. Q. To explain your plan a little more fully why do you restrict the area to $\frac{1}{3}$ rd of the available water-supply?—Because we can guarantee water-supply to that extent only in a year of drought.

166. Q. Why don't you propose to restrict to 13,000 acres?—Because you object to our working the canal on productive lines in ordinary years and protective in famine years. Possibly I may not be very clear; it is not $\frac{1}{3}$ rd of the area; it is $\frac{1}{3}$ rd of the water-supply.

167. Q. One-third of the water-supply?—Yes; I would set that apart for perennial crops every year; that would give fixity to irrigation.

168. Q. You guarantee $\frac{1}{3}$ rd of the water-supply to perennial crops?—Yes, to the blocks in which I propose to carry on "fixed" irrigation.

169. Q. They can use the water for what they like?—No; I would have about one-third of the area only under sugarcane; some such condition would have to be put in.

170. Q. You would not interfere in any way with the village?—Not so long as they manage properly. If they wasted water or quarrelled among themselves, we may interfere and regulate.

171. Q. Will they not look upon it as a permanent assessment?—We don't want permanent assessment; we only want fixity for six or seven years. I should accept joint applications from each village for six years.

172. Q. What would you charge for $\frac{1}{3}$ rd water-supply?—About Rs. 12 to Rs. 15 per acre.

173. Q. If you guarantee $\frac{1}{3}$ rd of the supply, how can you charge upon acreage?—The area which one-third of the supply annually available can irrigate will be estimated. This area will be distributed among the villages. There will be a fixed rate per acre on this area. The only condition imposed will be that the area under sugarcane should not be more than one-third of the total area of the block.

174. Q. You will estimate what the area would be?—Yes; approximately. It is much easier to estimate for a block than for a field.

175. Q. Will you measure the area every year?—No; once measured, the "fixed" area is known.

176. Q. You say, "I give you for six years $\frac{1}{3}$ rd supply and we estimate that you should irrigate so many acres?"—But one-third of the supply has nothing to do with the individual villages. The entire area of the blocks of all the villages will require one-third of the supply.

177. Q. Suppose the supply is short?—We guarantee only $\frac{1}{3}$ rd of the minimum available supply. Our ghât-fed tanks always fill—even in a year of severe drought.

178. Q. (The President.)—For statistical purposes you would measure up the area?—Blocks are fixed for six years and the area is known. No measurement is necessary every year.

179. Q. Suppose a man has got one or two fields outside the area and puts in sugarcane?—We would not give him water except on the permissible system.

180. Q. (Mr. Muir-Mackenzie.)—Do you take it for granted that they would take water?—They are willing to take it on these lines on the Nira Canal; people have already sent in applications. I believe the Local Government is favourably disposed to give the scheme a trial if it is shown to be practicable.

181. Q. (Mr. Higham.)—You think you will irrigate a larger area of perennial crops if you guarantee them $\frac{1}{3}$ rd of the supply than they have irrigated in the past?—Yes, we have now 5,000 acres of sugarcane on the Nira that brings about a lakh of revenue; we should have 7,000 under my scheme.

182. Q. Why?—Because during years of good rainfall we can give water for perennial crops which in bad years will be protected by walls.

183. Q. What would prevent them from putting down sugarcane now under the present system?—They are not sure of the water-supply; if rain fails, we restrict the supply.

184. Q. The cultivation of perennial crops on the Mutha Canal is now more or less a gamble?—I think so, as regards $\frac{1}{3}$ rd or $\frac{1}{4}$ th of the area.

185. Q. Is the supply to perennial crops uncertain on the Nira Canal?—Yes, it depends on the locality. In the upper reaches the crops are practically safe. In the middle of the canal the supply is uncertain.

186. Q. Taking an average?—About $\frac{1}{4}$ th is uncertain.

187. Q. (Mr. Ibbetson.)—There would be less gambling under your new system?—Yes.

188. Q. And then in addition to that you would have also the 'perennial' area on which there would be a certain amount of chance?—Yes, that is a great point.

189. Q. (Mr. Higham.)—What do the people do in the year of famine; do they reduce the area of cane of their own accord and increase the area of food crops?—We reduce the area of sugarcane for them; the whole thing is done by us. My experience in this district is that the demand for sugarcane in a bad year is as great as in ordinary years.

190. Q. I think the Bombay Government have several times explained the reduction in the area under sugarcane as due to famine and plague?—It was due to the low rate of raw sugar in 1897 and 1898; these abnormal causes operated also. But since 1899, in which year I took charge of these canals, the demand for water for sugarcane has been as keen as for dry crops.

191. Q. Ordinarily considered, people would cultivate as much cane as they possibly can even in a famine?—Yes; that is the tendency.

192. Q. I suppose in a famine year an acre of cane is quite as good as an acre of fodder crops?—A great deal better; it will employ more men and for 12 months instead of 4.

193. Q. An acre of sugarcane requires more water than an acre of dry crops?—Yes; about 8 to 10 times more. The gross produce per acre of sugarcane is valued at about Rs. 600 and fodder crops fetch about Rs. 80 in a famine year and Rs. 30 in ordinary years.

194. Q. (The President.)—How many cubic feet do you require for an acre of sugarcane?—About 8 or 4 lakhs of cubic feet. The yield of cane is worth about $7\frac{1}{2}$ times that from *rabi* crops.

195. Q. It will pay you better to use your water upon dry crops than it will upon sugarcane crop if sugarcane takes 10 times the amount of water and only yields $7\frac{1}{2}$ times the produce?—But the demand for sugarcane is constant; not so for the dry crops. Besides, the dry crops require water either in the monsoon or in the *rabi* season when the water is not so valuable.

196. Q. Could you irrigate seven times as great an area of dry crops as you could of cane if you stop sugarcane altogether?—Ten times more of *rabi*; for every acre of cane we can irrigate 10 or 12 acres of dry crops.

197. Q. Would water be taken?—Only in years of drought, not always. For perennial crops the demand is constant.

198. Q. (Mr. Muir-Mackenzie.)—Do you think that the rates now charged on the Nira Canal are unnecessarily low? Do you think that people can pay a higher rate?—I think the rates are very good now, but they are capable of increase in three or four years' time.

199. Q. Why must we wait?—On account of famine.

200. Q. People on the canal are rich and prices of crops have risen?—Yes.

201. Q. Why do you say we ought not to increase them; I ask you generally whether the rates charged are in your opinion excessive or too low?—For ordinary, dry, and monsoon crops the rates are fair; for cane the rate is low.

202. Q. How long ago were these rates discussed?—On the Nira Canal very recently; on account of famine they have not enhanced the rates.

203. Q. (Mr. Higham.)—Could you give me details of your expenditure on Revenue establishment—the establishment that you have to maintain on the Nira Canal?—Yes. (Refers to statement I C.)

204. Q. What is your charge on establishment?—About 20 per cent. of the gross revenue.

205. Q. What do you allow for collection?—Five per cent. on total receipts.

206. Q. Who does that go to?—The Civil Department.

207. Q. Twenty-five per cent. is taken for the maintenance of local establishment?—Yes.

208. Q. Do you know how they exactly divide the establishment between the works and revenue?—We have got

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209. Q. You recommend as one means of protecting the provinces from famine that the Government of India should allow you to spend about 10 lakhs a year on new works?—Yes.

210. Q. Is that 10 lakhs for the whole province or for the Poona district?—For the Presidency proper excluding Sindh.

211. Q. I think the cost of irrigation works on an average is about Rs. 200 per acre?—Yes, according to the present system of accounts.

212. Q. Ten lakhs a year would ultimately go to increase the area by 5,000 acres per annum?—Yes.

213. Q. At the end of 20 years you would be prepared to meet famine with 100,000 acres?—Yes, it looks small, but it would mean double the present area.

214. Q. What percentage would that be of the area under cultivation?—Something very small; I do not expect any great results from irrigation alone; have said so in my Memorandum.

215. Q. You say double the present area?—It is not enough; if you give 20 lakhs it would be a very good thing. —I only mentioned what we were likely to get; not what I thought was necessary. Before the famine we were getting 1 or 2 lakhs a year. So 10 lakhs are a large amount comparatively. I would welcome 20 to 30 lakhs.

216. Q. (*Mr. Ibbetson.*)—The cane is a very valuable crop; you cannot afford to risk it; it takes a large quantity of water; you must know how much you have to provide for. In your note you say the cultivator grows fodder crops in the hope of being able to do it without your water; he goes on waiting from day to-day hoping for rain and when he does want your water he wants it in a hurry and must get it at once; any delay on account of his having to submit an application would be very injurious; would it do to have applications for cane only, to give the cane area preference but allow people to use the balance of the water as they liked?—In the monsoon there is no difficulty; on many canals there is some water to spare and this they can use. There is a Government order permitting us to give water for dry crops without waiting for application.

217. Q. Have you never in your time imposed double rates on men for taking water without application?—Not on dry crops, except when all the water was required for crops for which water applications had been accepted.

218. Q. Why not extend the same principle to those who take water for fodder crop, wheat, gram and *juar* when they choose at the end of monsoon as long as you get your sugarcane watered?—Our water-supply becomes very valuable after the monsoon. Our stock is limited and we have to use it in as profitable a manner as possible. We have to regulate between sugarcane and other crops.

219. Q. Suppose you give sugarcane the preference then would you give water for other crops without application?—Only where we have an unlimited supply. The supply is so uncertain; we have to look ahead and provide for sugarcane sowings in March or April.

220. Q. Before 1898, I understand that a great deal of your water was unused on these canals?—To a great extent; it was in 1898 also; but we never have any water unused in these days, not during these last three years.

221. Q. Before that?—The people would not take it.

222. Q. Would they not have used your water if you had allowed them to take it without making an application?—It might have had some slight effect: perhaps about 5 per cent., but we did not want to let the area go out of our hands.

223. Q. In a good year you abolish application?—No, we relax stringency, in accordance with the orders of Government.

224. Q. The application system would only be worked strictly in a bad year?—Yes, but sometimes we have to place restriction year after year, except in the monsoon, if there is a considerable extension of perennial crops under the canal. This remark applies to the Mutha Canal only, which is a productive work.

225. Q. In your scheme of irrigation you guarantee $\frac{1}{3}$ rd of the water-supply, presumably for cane irrigation, and give $\frac{1}{3}$ rd on your 'permissible' system; if people are willing to give $\frac{1}{3}$ rd on your 'permissible' system why not get the first $\frac{1}{3}$ rd taken on the same terms, that is have $\frac{1}{3}$ ds 'permissible' and no 'fixed' area? Because in the permissible

area then there would be uncertainty of cultivation; water would not be available in a year of drought.

226. Q. Do you think they will always prepare their land for $\frac{1}{3}$ rd if it is fixed?—Yes.

227. Q. They won't prepare for $\frac{1}{3}$ ds?—They will sow every year; my object in having $\frac{1}{3}$ rd permissible is to have $\frac{1}{3}$ rd of the water-supply in a famine year for dry crops. They prefer to have an assured supply which would only be available for the "fixed" area.

228. Q. (*Mr. Muir-Mackenzie.*)—If you don't have a fixed area you don't get extension?—No.

229. Q. (*Mr. Ibbetson.*)—You say this permissible water would be very largely used by people with wells?—Yes.

230. Q. Is it not waste to give canal water to people who have got wells?—It pays them to use canal water. If they are left to wells alone, unaided by canal water in good years, they will abandon irrigation.

231. Q. Speaking of tanks, you say "smaller tanks perform a useful office in Madras, namely, to protect the rice crop during a break in the weather." Why should not they do the same in the Deccan?—Because they have rice in Madras; we have no rice here.

232. Q. Is there no rice in the Deccan?—Very little; there is rice on the hills, of an inferior kind; it does not pay the cultivators to go to the expense of rice cultivation here.

233. Q. Would small tanks be of use generally in the Deccan?—Yes, small tanks will do good in many ways.

234. Q. How?—There will be moisture and the water-level in wells will be high in the neighbourhood.

235. Q. Would there be any irrigation?—A little perhaps; indirect irrigation from wells there will be.

236. Q. Directly they won't pay?—No; small tanks will not pay in the Deccan.

237. Q. Do you think people would be ready to contribute for their construction?—I think they may be asked. The experiment is worth a trial.

238. Q. You say, "one reason why well irrigation is not largely practised is that the sub-soil over wide areas is rocky which makes well excavation a matter of great expense." Do you think people would use wells largely if they had them; would it be profitable to work them irrespective of the cost of making them?—In a famine year they would pay.

239. Q. That would be one year in ten?—Yes.

240. Q. Would it pay a man to use a well if it were made for him?—It would depend on the enterprise of the man; if capital and manure were forthcoming it would pay.

241. Q. You say that it is by artificial debits that working expenses are enhanced?—Not as regards the working expenses; the charges are fair on the Nira and Mutha Canals; but in regard to capital expenditure there are artificial debits.

242. Q. Is the capital expenditure enhanced?—Yes; to some extent by artificial debits.

243. Q. On the Mutha and Nira Canals you have separate establishments for supervision of irrigation?—Yes.

244. Q. Your working charges are actually what it costs?—Yes.

245. Q. There is no artificial debit?—I am not prepared to go so far as that.

246. Q. Is there a large artificial debit?—No.

247. Q. They are mainly actual?—Yes.

248. Q. You say that the actual average working expenses would be about Rs. 3 per acre?—Yes; they vary; Rs. 3 are for the whole area in the Presidency. On the Mutha Canal the working expenses amount to Rs. 7, because the principal crop is sugarcane.

249. Q. You say that an acre of cane costs much more for maintenance than an acre of *juari*?—Yes.

250. Q. What makes up Rs. 7?—Maintenance, repairs, and establishment.

251. Q. You say the average is Rs. 3, and cane, which forms a substantial portion of your crops costs Rs. 7. What does *juari* and wheat cost?—A good deal less.

252. Q. Could you give me an idea?—Say Re. 1-8.

253. Q. Suppose you double the area of wheat and *juari* you would not double your expenses?—No, we would reduce them, that is, judged by the rate per acre.

254. Q. Your Rs. 3 includes all crops?—Yes.

255. Q. What is Rs. 1-8?—For wheat and *rabi* crops only; the average is Rs. 3.

256. Q. As *rabi* only pays Rs. 2 and working expenses are Rs. 3, therefore you say it would not pay you to increase your area under wheat? I am referring to the results in the whole Presidency. We have got about 100,000 acres under irrigation. I have said the total area considered irrigable is 300,000; supposing we had all these 300,000 under *rabi* area our total revenue would be less than what it is now.

257. Q. On page 13, you say, "the Executive Engineer is required to keep his tanks and canals up to a certain standard of efficiency and when he has done this the water may run to waste or remain locked up in the tanks for all he cares." Is this an exaggeration?—I say so to make the position clear. We have not worked that way in this district.

258. Q. What I want to know is this. Is there anything in the present system which could show to the Executive Engineer how the canal pays?—The Revenue report shows that

259. Q. Not until the Revenue report comes?—No, the final figures are sent to the press by the Examiner, Public Works Accounts.

260. Q. Could he not get an idea?—Yes, a rough idea from areas and expenditure in his own accounts.

261. Q. Is there anything which you would suggest to enable the Executive Engineer to have a keener insight into the use of water?—I think the Executive Engineer must study carefully the irrigating capacity of the work, and watch the operations from week to week; otherwise if there is a deficiency of water the crops will suffer or water may be locked up and remains unused.

262. Q. All these things depend on the man who has charge?—Yes; I have got charge of the Mutha Canal, and if I do not clear the silt, I may show a saving of, say, Rs. 10,000 and get credit, the resulting evil effects will not be felt in my time, but in my successors'.

263. Q. Is there then anything you could suggest that would give the Executive Engineer a keener insight?—If a programme is drawn up to see month by month what water there is and what area under irrigation, the Executive Engineer will be able to take steps to stop extension of irrigation if the water-supply is scanty, or to extend the same if the supply be abundant. If they know that we are able to give water liberally, probably people at the tail of the canal will take it. There has always been less water than there was demand for in my time.

264. Q. You never had surplus water?—We never had more water than we could use during the last three years. In good years, they do not want it for ordinary dry crops, and then there is a surplus.

265. Q. Do you know the reason of the difference between Imperial and Provincial districts?—There are several classes of works in progress in a district. Irrigation Work (Imperial), Military Works (Imperial), Roads and Buildings (Provincial.) The district is classed as Imperial if works of that class preponderate, or Provincial, if the major portion of the expenditure in the district is from Provincial Funds. Certain fixed percentages are charged for establishment on all miscellaneous works and the balance of expenditure debited *en bloc* to the class of works which decides the classification of the district. In the Sholapur district only fixed percentages are charged on irrigation works (refers to para. 36 and reads from Appendix, page 23), and the result is the establishment charges are very low in that district.

266. Q. At page 10, paragraph 36 of your Note you say, "Total cost of maintenance, including share of revenue management." What is the share?—They charge 25 per cent. on actual works expenditure.

267. Q. Of the two canals, which do you say is protective?—The Nira.

268. Q. I understand that you actually held up water in reserve in order to provide against a year of drought?—Yes.

269. Q. Are there any orders to that effect?—It is regulated by practice and by the general impression that the Government of India want a large area of food and fodder crops to be irrigated, especially during years of scarcity.

270. Q. The general impression is that the Government of India wish that food and fodder crops should be protected?—Yes.

271. Q. There are no specific orders?—I have already quoted some orders which can be read that way. I have

also explained why the Government of India associate increased area with improved results. Mr. M. Visvesvaraya.

272. Q. You say you cannot give sufficient water for high class crops?—Yes, now-a-days, to the extent there is demand for it. 20 Dec. 01.

273. Q. Practically there is no demand for water, except for these high class crops, in a year of fair rainfall?—No large demand.

274. Q. We were told yesterday that certain people would take any amount of water for dry crops if you give it every year?—There is no demand for dry crops; they won't take the water; they will wait till the last moment for rain, and if rain fails, then they rush for canal water.

275. Q. They won't begin to irrigate before they know that the rain will not come?—Yes, they won't insure their crops beforehand.

276. Q. You say, "fear of enhancement of revenue exists in the case of well irrigation;" do you say that from your own knowledge?—The statement may not be correct; I have heard reports, but have no personal knowledge.

277. Q. (Mr. Muir-Mackenzie.)—Have you ever heard people say so?—Yes; I think it is not a fact.

278. Q. (Mr. Ibbetson.)—There is no enhancement, but they are afraid?—Yes, there is no doubt about that. It would be a good thing if Government published their intention broadcast; then there will be no fear.

279. Q. Do you suppose that in this district there is one year of famine in ten?—I could not say. There have been four bad years within the past six years.

280. Q. How many scanty rainfalls are there in ten years?—In the eastern part of the district it would be quite five.

281. Q. In the western parts?—Nine years out of ten are fairly good.

282. Q. How many years in the eastern part?—Four good years, five bad years, and one a famine or very bad year.

283. Q. Do you know why Government has prohibited the irrigation of sugarcane in the neighbourhood of towns and villages?—For sanitary reasons.

284. Q. Are you forbidden to give water to sugarcane within a quarter of a mile from the villages?—Yes; if there is a nulla between, water is allowed; otherwise irrigation of perennial crops is generally forbidden, within $\frac{1}{4}$ mile of villages.

285. Q. (Mr. Muir-Mackenzie.)—Is there an order to that effect?—Yes.

286. Q. Can you produce it?—Yes; I can. There are strong objections to a heavily manured crop in the vicinity of a village.

287. Q. (Mr. Ibbetson.)—What kinds of crop are heavily manured?—Sugarcane especially. Whenever there was irrigation formerly it is not prevented; but only extension of irrigation to new lands within $\frac{1}{4}$ mile is.

288. Q. Is compensation given to water-logged lands?—I have never received an application; I should think Government would be very favourably disposed to consider applications in cases where any real damage is caused by water-logging.

289. Q. (Mr. Rajaratna Mdlr.)—I find that the capital outlay on irrigation works in the Bombay Presidency, direct and indirect, was 486 lakhs, of which you have only cleared off 5 lakhs to the end of the year, thus leaving a large amount on the wrong side of the account. No wonder the Government of India objects to further grants; can you tell me how this is?—It is due chiefly to accumulation of interest charges. I have already said that our works do not pay. The yearly net revenue falls short of the interest charges on the capital laid out.

290. Q. Now turn to the Mutha Canal, do you know that the capital outlay was 62 lakhs and the interest 62 lakhs. Why is the interest so high?—The work was spread over a number of years and though practically completed in about 1875, there are works still going on which are charged to capital. Besides, the yearly net revenue does not yet cover the interest charges on the capital.

291. Q. (The President.)—I suppose the dam was very costly and the cost high in proportion to the size of the canal?—Yes, also it took many years to complete the work.

292. Q. (Mr. Rajaratna Mdlr.)—Do you think it possible that by building storage works you could make the canals pay a larger return?—Yes. At the present moment there are two schemes for increasing the storage of the Mutha

Mr. M. Visvesvaraya. Canal under consideration. The proposed storage reservoirs will probably cost from 15 to 18 lakhs of rupees. They are mentioned in Mr. Beale's report.

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293. Q. They have not been forwarded to the Government of India?—No. They are only rough estimates based on preliminary surveys.

294. Q. On the first page of your answers you give the culturable area as 289,981, what does that represent?—The total culturable area commanded by the new irrigation works in the Poona district.

295. Q. Will the existing works irrigate that large area?—That is only the area commanded.

296. Q. The actual area irrigated is not given; can you tell what the area irrigated will be when all the works are completed?—I cannot give it for the whole Presidency; in the Poona district about 65,000 to 100,000 acres can be irrigated annually.

297. Q. Could you irrigate a larger area if you extended the area of dry crops?—Yes, we could make the Nira Canal works irrigate a larger area if we gave a larger amount of water to dry crops than we at present do, but more area means inferior crops.

298. Q. Against the Mutha Canal large revenues are shown under miscellaneous, indirect and direct. Can you explain it?—They include receipts from the water-supply to the Poona Cantonment, which amount to about Rs. 1,25,000.

299. Q. On the Nira and Mutha Canals how much sugarcane or perennial crops is under irrigation?—Under the Mutha about 4,500 acres and on the Nira about 5,600 acres.

300. Q. Can these areas be increased?—Yes, if we reduce the other class of irrigation. On the Mutha we have reached the limit, but on the Nira we could decrease the area of *rabi* crops and increase that under perennial.

301. Q. I notice that the *rabi* crop except in years of drought is 14 or 15 thousand?—That is during years of very seasonable rainfall: ordinarily the area is about 25 thousand acres.

302. Q. On page 4 of your Note you say that irrigation works get no credit for increase in land revenue. Do you get no credit?—We get practically none. They get 90 per cent. in Sind. We do not increase the land revenue here on account of the canals. Perhaps you refer to 2nd class irrigation works such as *bandharas* on which a consolidated rate is fixed. On these we get about 65 per cent. of the consolidated rate credited to the works. Under first class works no portion of the land revenue is credited to the works.

303. Q. If you add the water-rate to the land assessment, what proportion is the water-rate?—The Nira Canal is what is called a Capital Account work and land-rate and water-rate have no connection with one another. In the case of second class works, the figures are given in the Irrigation Revenue Report for the Bombay Presidency.

304. Q. When waste lands are brought under cultivation for the first time, do you not take credit for land assessment in addition to the water-rate?—No, I am not aware of any such credit.

305. Q. You say you would have a fixed area for which you would allow irrigation under your "block" system; will not this benefit only a favoured few?—The blocks, it is true, will be on land owned by a few people, but all the villagers who require to participate, may obtain share of the area by exchange or lease for the period the water-supply is guaranteed to the block. The water-supply to a block will be granted only after the villagers have come to a satisfactory agreement among themselves in this respect.

306. Q. You fix the block in the holdings of two or three rayats; would it not be possible to fix a share in each rayat's holding?—If we give a water-supply to any field wherever situated the waste of water would be very serious. The water which would be saved under the block system, would probably suffice for one-third to one-half more area. There is now a lot of waste from field to field on the distributaries.

307. Q. Is your plan workable in practice?—Yes. I think so.

308. Q. But only a certain number of rayats will benefit by it?—We propose blocks of 50 acres or more, and we propose that all the villagers should share in the benefits of the fixed area.

309. Q. I think there is a serious objection to fix the block at 50 acres. Why not apportion it according to the holdings?—Yes, you may do that.

310. Q. According to your proposal the poorer men will be excluded?—We can easily frame rules to bring in all

who want a share. Before sanctioning a block, the cultivators should be asked to come to an understanding among themselves in this respect. Obtaining land by lease for sugarcane cultivation is a common practice in this district.

311. Q. On page 8 of your Note, you say that on the Nira Canal the rate paid is 15 to 20 rupees for sugarcane, is that the maximum; don't you charge 40 to 50 rupees sometimes?—The rate given is the average rate for sugarcane.

312. Q. In regard to clause 3 of the same paragraph on page 8 is the rate charged on the whole area or only the irrigated area?—On the whole area, whether irrigated or not.

313. Q. In regard to paragraph 22 on page 9, have there been no cases of private canals?—Not that I am aware of.

314. Q. Do you permit the construction of canals if the people consent to pay enhanced water-rates?—If they build them at their own cost, we may remit the water-rate for, say, 10 years.

315. Q. Is there scope for private canals in the Poona district?—Yes, if liberal concessions are given, but Government should be prepared to lose money. Either Government should construct the canals themselves or forego irrigation rates for a long time. The people want a quick return.

316. Q. If we gave remission for five or ten years, would that induce the people? Would capitalists take the matter up?—Yes, but there is the question of ownership of land.

317. Q. But supposing Government assisted them in acquiring lands?—Then I think extension on minor streams would be possible to a very limited extent.

318. Q. Now in regard to the system of applications from rayats, you know what area is irrigated; could you not dispense with the applications, subject to the condition that if a man wishes to change his four-month crop into perennial he must apply?—There are three or four classes of crops and I do not think it would be possible.

319. Q. For each village the area is known. You make your approximate estimate and tell the rayat that he is at liberty to take water until he changes his crop. Would that not work?—The cultivators change their crops so often that there would be trouble in regard to the sufficiency of the water-supply. I am sure it is not possible on these canals. If we bound ourselves to give water, the agriculturists might sow perennial or *rabi* or any other class of crops. This varies according to the nature of the crops and if a large proportion is perennial or rich crops which require water, say, in the hot weather, the water-supply may fail. For regulation of water-supply, both area and class of crops irrigated should be known.

320. Q. Put if they change the crops they must tell you?—I don't think they will take water on those terms, as they constantly change. The notices would give quite as much trouble as the applications.

321. Q. But the notices would be fewer than the applications?—Yes, but it is most necessary that we should know especially in seasons of drought, what crops we are to have.

322. Q. You can measure them up?—There would be practical working difficulties. We might do it over a restricted area, but not over the whole district. We want to know early what water is required, as we may have to restrict the new sowings of sugarcane or perennial crops.

323. Q. I don't see what the difficulties are?—There would be serious difficulties. Your proposals would do for small tanks, but not for such large works as we have in this district. We must know within 100 to 150 acres what crops we have to give water to. The crops sown in a good year may extend to a year of drought and fail for want of a sufficient water-supply.

324. Q. (*Mr. Muir-Mackenzie*.)—I notice that in Mr. Beale's report the working expenses of the Nira Canal are only 1.75 in ordinary years and Re. 1 in a maximum year. I do not understand the Rs. 3 per acre that you mention in your note. Do you mean both the Nira and Mutha, or the Nira alone?—About Rs. 3 is the average rate of working-expenses for the whole Presidency. It includes artificial debits. *Vide* page 29 of the Irrigation Revenue Report for 1899-1900.

325. Q. What about the Mutha?—The average does not hold good for the Mutha Canal, as the crops grown under it are chiefly sugarcane or other perennial crops, and the rate of working expenses for such crops is very high.

326. Q. On the Pravara river and the Lakh Canals the average in ordinary years is Rs. 18?—That is an artificial rate, not the actual.

327. Q. Also on the Kadwa?—Yes. The high charges in both Nasik and Ahmednagar districts are due to their artificial classification as "Imperial" districts, as explained on page 10 of my Memorandum.

328. Q. On a work like the Maladevi, which will irrigate 30,000 acres in ordinary times and 60,000 at other times, the conditions are not dissimilar to those of the Nira. Will the irrigation charges be higher than those of the Nira?—No. Mr. Beale had calculated the charges on the maximum area, whereas it should be calculated on the average, which will be a much smaller area. If the work is in an Irrigation Division we might expect a little over Rs. 1 though Mr. Beale estimates Rs. 3.

329. Q. I gather that there is no doubt that in years of ordinary rainfall you have a considerable amount of water to spare in the Nira?—We have had no such experience since the drought overtook us, but previous to that there used to be a surplus.

330. Q. In a year of good rainfall, might not you dispense with the applications, other than for cane, after the monsoon has declared itself?—Yes, but in that case we would have to enlarge our distributaries, as the crops sown might otherwise come to harm. In the monsoon there would be no great difficulty. We do allow the cultivators to take water in the monsoon before sanctioning the applications.

331. Q. After the monsoon?—After the monsoon we work the rules very strictly, as we have to be very careful. Otherwise the water-supply may fail and the crops may be ruined.

332. Q. You generally know about September whether you will have a good rainfall. Well if you were assured of that, could you not dispense with the applications?—We have on the Nira about 100 miles of canal and the discharge in the hot weather is often not more than 100 cubic feet per second, and if we dispensed with applications the cultivators would probably use the whole supply up early in the season. We might dispense with applications in regard to the upper 30 miles of the canal, but even in that reach the area under irrigation should be determined by measurement for regulation of the water-supply.

333. Q. But if you are sure there would be water?—We have distributaries of limited discharging capacity. They would have to be enlarged so as to be able to carry the maximum supply that might be required.

334. Q. In order to get rid of those applications you might increase your outlets?—Yes, we might do that.

335. Q. Have you any hope that if you dispense with the applications the people would irrigate more?—They won't irrigate much more than they do now; I think there might be an increase of 5 or 10 per cent. If you remove all restrictions, there would be an increase, but there is the question of practicability. We might try it over restricted areas if a trial is necessary.

336. Q. I understand that the prohibition to the cultivation of perennial crops near towns and villages is restricted to future extensions only?—Yes. That is so.

337. Q. Do you use *poudrette* on the Nira Canal?—Yes, the people are now collecting night-soil in the villages.

338. Q. And fish manure?—Yes, they are using fish manure also.

339. Q. But they do use night-soil in the Nira Canal villages?—Yes, they do use it to some extent; they get it from the rubbish heaps. They don't collect it systematically except in Baramati.

340. Q. Mr. Mollison informs us that in Khed they are taking great pains to collect it?—I don't know about Khed, I know they use *poudrette*, fish and oil cake largely on the Nira and Mutha Canals. They get the cake from Gujarat and the Sabarmati.

341. Q. Is sawflower cake not used?—I cannot say.

342. Q. Is it your experience that the people fear enhancement of revenue if they sink wells?—Though I

cannot give any definite instances, that is the general opinion. Mr. M. Visvesvaraya.

343. Q. Have you noticed that it has any effect in deterring the people from applying for *takavi*?—I should not like to say; I have no personal experience one way or the other.

344. Q. You say that if Government construct wells in private holdings the wells will be more expensive by reason of the cultivators' labour not being utilized?—The work will be more substantial and last longer but will cost more.

345. Q. If the cultivator can make it for Rs. 500, how much will Government spend?—There will be a want of personal interest in Government servants and I think the expenses will be about 50% more.

346. Q. To come to this "fixed" area of yours, I understand that it is fixed not only in the matter of extent, but also in the matter of locality. You are particularly anxious that certain plots should be fixed?—Yes, my object is to save loss of water. Under old works, you notice, the *thals* or irrigable areas are fixed in this way.

347. Q. You would like to see large storage tanks in the ghâts, do you mean that they must be located in the ghâts?—Not necessarily; suitable sites on the rivers would do well enough. But the further away you make them from the ghâts the higher would the dams have to be and masonry dams are expensive. Very high earth dams are a source of danger in the monsoons.

348. Q. Would the *ghât* tanks lend themselves to famine labour?—Not often, but people could be employed on the canals.

349. Q. Would you kindly tell me whether you think that the crops in the famine year on the Nira Canal were equal to or superior to the crops grown in other parts in a year of good rainfall?—Yes, the yield was equal to that of a year of good rainfall; it was more valuable and fetched higher prices.

350. Q. You would never get a 16-anna crop from the land?—We would often get a 12 to 15-anna crop, but never less than 8 annas.

351. Q. Would you like to see the whole area given up to perennial crops in ordinary years?—No, I would not like the whole area given up to perennial crops. I would like the dry crop to go on by rotation to a certain extent, as they keep the distributaries in order to render the watering of large areas easy in times of famine at short notice. It is not difficult to restrict the perennial areas in famine years.

352. Q. Supposing the restrictions were removed, would it be possible to supply water for the dry crops in famine years?—Yes, but there would be great difficulty after the beginning of the *rabi* season. We might have a large area to water and an insufficient water-supply.

353. Q. If you managed the works on productive principles would it be difficult to make them protective in a year of famine?—Yes, if managed solely on productive principles in ordinary years.

354. Q. If you work on productive principles there is great danger of the works losing their protective characteristic in a year of famine?—That is so if by protection is meant the saving of dry crops.

355. Q. If a crop is grown in black cotton soil this year it must be manured to give a good crop the following year; unless manured an inferior crop will result. That is an established fact; is not that so?—Yes.

356. Q. Do you believe that irrigation is of value in deep black cotton soil without a *murum* sub soil?—With light waterings and sufficient manure, deep black cotton soil may be utilized for irrigation to some extent chiefly for the richer classes of crops.

357. Q. It is a soil not requiring a great deal of water?—Yes. They raise garden crops on such soil from wells.

358. Q. On deep black cotton soils?—Yes; they are irrigated by wells to a certain extent in this and other Deccan districts. They are not good for growing, by irrigation, crops usually grown on rainfall.

WITNESS No. 56.—MR. H. V. R. KEMBALL, Executive Engineer, Presidency.

1. Q. (The President).—You are Executive Engineer, Presidency District, Bombay?—Yes.

2. Q. You held charge of the Poona District in the last famine?—Yes.

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Kemball.

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Mr. H. V. R. Kemball. 3. Q. From what you saw of the famine here, what do you think would be the best course for Government to adopt in order to be prepared to resist another famine?—That is a difficult question to answer. It is a question of ways and means.

4. Q. Presuming the means were available, what would you suggest?—I would suggest storage tanks in the ghats with pick up weirs in the rivers where they are wanted. Chains of tanks as far as possible near the rivers to be filled from the pick up weirs. My own opinion is that it would be very expensive to carry water direct by canals from reservoirs in the ghats.

5. Q. What do you think of storage canals in the beds of the rivers?—I don't think they would answer and they would be very expensive.

6. Q. More expensive than reservoirs, at the head of the supply?—Yes. And on the small rivers their filling cannot be ensured.

7. Q. Is there a better chance of finding a site for large reservoirs in the plains or the hills?—In the hills. There are many sites in the hills, but the difficulty is to get the water away from them.

8. Q. Why not let the water go down to rivers?—That is what I advocate, but I have not given the subject a great deal of thought.

9. Q. You have been on relief works, what do you think the best form of famine relief labour?—It is more easy to say which is the worst. I think that road metal breaking is the worst. I thought at the beginning that it was a good test of destitution, but I have changed my mind. Those who are poor lose heart and those who are well-off are satisfied with small earnings.

10. Q. You do road work with the metal?—The question is whether the road is wanted or should be maintained. The present roads were aligned before the railways were made and the alignments are not suitable to present day conditions. What is wanted is roads from the trade centres to the main or goods railway stations. If such new roads were made they would have heavy traffic. Funds for repairs are limited and it is no use making roads or metalling old ones unless you can afford to maintain them.

11. Q. Were such roads made during the famine?—The programme was deficient and few such roads were made. I was new to the district.

12. Q. The country roads are not very much used. Some are not. Roads with light traffic need little making, only roads with heavy traffic need metalling. It costs Rs. 300 a mile to maintain a metalled road and unless you can afford this it is a waste of money to metal it.

13. Q. What kind of work then do you recommend?—It is difficult to find works that are useful unless you take up tank works. I have no objection to these in the absence of a cheaper form of famine labour, but they necessitate subsidiary expenditure and have to be left unfinished sometimes.

14. Q. But I suppose generally speaking they will be furnished afterwards?—Yes, I think the greater the extension of irrigation the greater the prosperity of the country and the greater the power to resist famine.

15. Q. (Mr. Higham).—I suppose that in the Poona district there is nothing more to be done in the way of road making?—I think a number of the present roads might be unmade and new ones made in their places.

16. Q. Then there is room for roads in certain places?—Yes, in places where there are no roads now, but where there should be roads.

17. Q. Why is metal breaking a bad test of distress?—Because the people don't like it, and cease any excuse for shirking. It requires good management, able-bodied men for ganging are few if the supply of metal for breaking falls short the workers are fined for no fault of their own. The workers who are well off do little and do not care what they earn. I found several of the villagers came to the works only to see their friends.

18. Q. The question is, is it a good test or not?—It is a good test, but not so good as I thought at first that it was.

19. Q. (Mr. Ibbetson).—I suppose you are living more or less from hand to mouth as to the matter of famine programmes?—Yes, more or less. It takes time and thought to make a famine programme before I left. I put a few useful works in the programme which I could not do before because I was new to the district. The programmes are now complete, but the estimates of the projects are not yet complete.

WITNESS NO. 57.—MR. E. O. MAWSON, C.E., Executive Engineer, Poona District.

I.—Memo. by Witness.

POONA DISTRICT.

Mr. E. O. Mawson. There are two Executive Engineer charges in the Poona District, one for Irrigation and the other for Roads and Buildings. The whole of the district was affected by the late famine; in the Roads and Buildings office the only works undertaken were the construction of new roads, the improvement of old roads and tracts and the collection of a metal reserve. On the construction and improvements of roads a sum of Rs. 4,64,659 was expended, while the amount spent on the collection of metal was Rs. 8,12,945. The works uncompleted at the end of the famine were—

Indapur-Baramati Road.—This work is a road improvement scheme situated in the south-east corner of the district; and its construction will facilitate the spread of irrigation on the Nira Canal.

Bhimashankar-Dimbah Road.—Is a ghat road running east and west in the Northern taluka of Khed. It will form a most useful road for bringing hirda and other hill produce from the Ghats.

Kajewadi-Malkiras Road.—This road connects the Poona District with the most barren talukas of Sholapur.

Paud-Borkas Road.—Is a ghat road opening up the hill country immediately to the west of Poona and will be

most useful in encouraging the hirda and other forest traffic.

Walhe-Parincha Road.—Is a feeder road to the Southern Maratha Railway. It is a hill road and will open up the fertile Parincha valley.

It would be of very great advantage to the Poona District if the above works could all be completed from Provincial Funds. The Local Funds are not in a position to do more than keep in repair the portions of the roads made by famine labour, and owing to plague, etc., it will be very difficult even to do this; and there appears no possibility of the amounts spent during the famine being made remunerative, either actively by tolls or passively by the opening up of new tracts unless the cost of completing the construction is borne by Provincial Funds. The Bhimashankar-Dimbah road is especially necessary to be completed as this link with the Ghats and to the principal religious fair in the district will increase the traffic on the whole of the main roads. There is already a famine programme for the Poona District and this is now undergoing revision and extension. Surveys for new works are now in progress to the extent of establishment available and new projects are under preparation. As regards the irrigation questions (*vide* Government Resolution No. 2325 of 2nd November 1901), they appertain to the office of the Executive Engineer for Irrigation, Poona.

Statement of works completed, etc., under the Executive Engineer, Poona District, during the famine of 1900-1901, as required by paragraphs 9 and 120 of Government Resolution No. 2275, Mr. E. O. Mason. Famine Department, dated 26th October 1901.

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No.	Name and classification of works.	Amount expended.	Completed or uncompleted. Incomplete works it is desirable to complete as a charge against Provincial or Imperial Revenue.	Reasons for proposing their early completion and results anticipated.	REMARKS.
	<i>Construction of new roads.</i>	Rs.			
1	Construction of a road from Rajewadi to Malsiras and Mawdi.	95,029	Incomplete in respect of masonry works, which would cost about Rs. 4,063. It is not emergent to incur this expenditure.	Rs. 300 can be advantageously spent in preserving the work done from going into ruin.	
2	Construction of a cart track from Khadkalla vid Bourkhind to join the Talegaon-Ambegaon Road.	13,684	Incomplete in respect of the approach on the south side of the Khind, which would cost about Rs. 30,963.	The work can well be postponed till funds are available. Rs. 300 can be spent for the protection of the partially completed work.	
3	Construction of Talegaon Railway Station Road.	12,971	Completed.	.....
4	Construction of a road from Dimbha to Bhimashankar.	1,03,965	Incomplete in respect of the last $3\frac{1}{2}$ miles in the ghats.	To make the road fully useful for traffic both on this and on the other side of the ghats, it is necessary to construct the last $3\frac{1}{2}$ miles and a bridge on the Gohe Nallah. These would cost about Rs. 28,750.	
5	Construction of a road from Paud to Bhorcas.	28,654	Incomplete in respect of masonry works.	It is absolutely necessary to incur an expenditure of Rs. 9,023 to make the road passable for carts. Cross drainage works must be done to preserve the work that is already done.	
6	Construction of a road from Junnar to Ghoda.	44,416	Completed.	.....	A causeway at a cost of about Rs. 2,000 to the Meena River is, however, necessary when funds are available.
7	Construction of a road from Walha to Parincha.	14,900	Incomplete.	To make the road useful as a feeder road to the railway, it is necessary to incur about Rs. 8,400 on cross drainage works and other petty items.	
	<i>Metalling or Metal Collection on roads.</i>				
8	Collecting metal on the Poona-Sholapur Road.	1,58,184	Completed.	The metal collected will be used up in repairs and in metalling the roads.	*Rs. 1,566 incurred from ordinary funds to complete unfinished items.
9	Collecting metal on the Poona-Nasik Road.	2,02,733			
10	Collecting metal on the Bombay-Poona Mail Road.	95,262			
11	Collecting metal on the Poona-Nagar Road.	3,33,910			
12	Collecting metal on the Junnar Narayangaon Road.	18,855			
13	Improvements to the Indapur-Baramati Road.	1,51,010			
	{ Famine				
	{ Ordinary	1,566*			

Mr. E. O. II.—Note on the possibility of protecting from drought
 Mawson. the eastern portions of the following districts :—Nasik,
 Ahmednagar, Poona, Satara, Sholapur, Belgaum,
 20 Dec. 01. Dharwar, and Bijapur.

Natural Features.—The western talukas of Nasik, Poona, Satara, and Belgaum contain the Ghats with spurs running down to the Deccan. This strip of country, varying from 4,000 to 2,000 feet above sea level, is from 20 to 35 miles wide. The rainfall on the western edge of the Ghats is from 350 to 200 inches per annum while that of the eastern side of this strip of country is 80 to 40 inches.

Nagar has only one taluka within the Ghat area while Sholapur, Dharwar, and Bijapur lying further east have a general lower level (about 1,500 feet) with small detached groups of hills.

Parallel to the Ghat line is a strip of country 25 to 30 miles in width with a fairly reliable rainfall of from 20 to 30 inches, while in the eastern talukas of Nasik, Nagar, Satara, and Belgaum and in the whole of Sholapur and Bijapur the rainfall (average about 23 inches) is variable and liable to fail.

On the Ghats and 20 miles to the east the rainfall is certain and excessive in amount; while in the middle strip of country it is practically sufficient for an 8-anna crop even in bad years and it is probable that any irrigation within this strip of land would need some nursing and would be of high class or perennial crops.

The cultivators would wait in the hopes of getting sufficient rain, even if their crops were beginning to wither, rather than pay for water. Moreover, it would be difficult to give water so as to save the crops over any considerable area when the ground had not been properly prepared nor doria made because most of the land in the area under consideration has too great a slope to be irrigable without previous levelling of the fields. Most of the land in this area is good black soil over muram; on which high class and perennial crops would do well and pay if the water were to be picked up by weirs on the rivers—The Krishna and Revari Canals in Satara may be quoted as instances of this form of irrigation.

The land of the eastern talukas of Nagar, Poona, Satara, and much in Sholapur and Bijapur is poor; there are stretches of miles of muram or shallow soil on which it would not be possible to grow irrigated crops.

The most of the good land is on the banks of the streams and rivers, generally fairly level black soil forming flat valleys between low ranges of hills or more often between the undulating poor land sloping on each side from the black soil. On account of this natural formation pick up weirs at short intervals on the rivers seem to be the most suitable form of protection so as to enable the water to be turned into the good land with a minimum length of canal.

There are two principal objections to large storage tank in this part of the Deccan which may perhaps partly explain the want of success from a financial point of most of the works already constructed—

- (1) As a rule it is necessary to have a considerable length of canal with little or no irrigation because the suitable dam sites are not near good irrigable land. The canals have often to be taken through muram in which the loss by percolation is very great.
- (2) The storage tanks have been constructed with a view to famine relief and not with the object of protection from famine; thus the dams are situated in tracts liable to failure of rain and the sites have been selected not as those most suitable for paying irrigation schemes but to provide work where it was most wanted during previous famines.

The works are therefore heavily handicapped to start with and cannot be expected to be remunerative nor can they be considered as truly protective, because in ordinary years the rainfall being sufficient for the crops the cultivator will not prepare his land for irrigation on the chance of drought, and when most wanted, the water can be only partially taken advantage of.

The land which can be protected from large storage tanks with long canals must, from the nature of the formation and soil in the Deccan, constitute a series of isolated areas with large unprotected tracts surrounding them. It would appear advisable to have a greater number of small works spread over as much country as possible. It seems probable

that such works would also pay because if water for irrigation can be made available close to the land to be irrigated, thereby saving the loss by percolation in large canals and placing it within the power of a greater number of cultivators to irrigate small areas (for which there would be a sufficiency of manure locally) the rayats would be more ready to take advantage of the water in ordinary years.

Further, if a large number of small works with short canals can be constructed the entire local management might be placed under the village officers and some of the usual heavy establishment charges saved. The conversion of rain crop to irrigated crop would form an indirect protection, in that the irrigated crop is of greater value than the rain crop and the net amount of money which is produced by the land is increased. The exact manner in which this increased value is distributed would be a secondary consideration, the main point seems to be that if the value of the crops is increased, the village must be richer as a community and its inhabitants in a better position to maintain themselves during famine.

There would probably be a gradual tendency to increase the irrigated areas as the people begin to recognise the value of a sure and certain crop of high value in place of the precarious and cheap rain crop.

One possible means by which a large number of small works of the kind outlined above could be constructed, would be by building a series of weirs on the rivers, the land adjacent to which is generally fit for irrigation.

In rivers with a perennial flow a portion of the discharge could be utilised at consecutive villages by the construction of weirs alone, but in order to make such a scheme a success, and to insure protection in famine years, it would be necessary to construct large storage tanks in the Ghats, from which the quantity of water flowing down the rivers would be augmented. It is necessary to raise the water from its natural channel in the bed of the stream, to near the top of the banks, so that it can be taken off at a convenient level and distributed over the land. The only means by which this object can be attained, is by the construction of weirs across the streams. It is, however, essential that these weirs should be so designed that during periods of heavy rain, they will open automatically and present no material obstruction to the passage of the maximum discharge of the stream, in order that the flood level may not be raised to any appreciable extent, otherwise the adjacent lands would be submerged and damaged by flood water. So the weir should be constructed of some type of sluice gates.

It is, moreover, necessary that on the cessation of the flood, the sluice gates should close automatically, so as to allow only the diminishing flow to pass the gates, while impounding the water at a nearly constant level above the weir.

With automatic sluice gates acting in this manner the water above the weir is retained at a nearly constant height, about the level of the top of the sluice gates, and the whole or any part of the discharge of the stream can be diverted for irrigation, while the balance of the flow not so used, passes through the sluice gates and flows down the stream.

The automatic sluice gates illustrated in the drawings at the end of this note act in the manner above described, and by their use, the beds of streams can be converted into a series of natural storage reservoirs. While impounding part of the rainfall, which would otherwise run to waste, they enable the perennial flow to be used for irrigation, and allow any balance of water to pass down the alluvial. The sluice gates open automatically during heavy rainfall and present no material obstruction to the flood discharge of the stream.

With a series of such weirs the rivers which now serve only as water courses for the discharge of the rainfall could be converted into a series of irrigation reservoirs; serving both as the main canals by which water could be passed down from large storage tanks in the Ghats and distributed by small canals over the area to be protected, and also forming a series of small reservoirs which would tend to raise the sub-soil water level and improve the supply of neighbouring wells.

The main objections to the use of automatic sluice gates are—

- (1) Sand or silt may deposit in front of the gates and prevent their opening.

With the design appended to this note—judging from experiments with small gates—an accumulation of 1½ feet of silt against the bottom of a gate 10 feet high will not affect the working of the gates. As most of the pools

formed above the weirs would be 1 to 2 miles long, it is most unlikely, even in rivers with heavy silt-laden water, that this amount would be deposited in one year. As soon as the gates open the silt is at once washed away by the rush of water beneath them—

- (2) Trees and floating débris might be carried against the gates and so cause them to jam and prevent their closing.

In relation to this question there are two positions to be considered—

- (a) When the gates are horizontal, passing the ordinary flood discharge, the trees will be caught on an iron bar at the level of the F. S. level placed in front of the gates.
- (b) When the river is in exceptionally high flood the water passes clear over the top of the horizontal gates and so the debris would be carried over them.

The automatic weirs would prevent the silting up of the streams as in heavy floods during which the gates would be fully open there would be practically no obstruction in the water way, and any silt which had collected above the gates would be swept away, and the river bed would be cleared down to the level of the low masonry foundation weir on which the gates are placed.

The sluice gates and their mode of action are described in the accompanying appendix with statements of cost, etc.

The above proposals may be briefly recapitulated:—

- (1) To have a series of automatic weirs on small rivers so as to form a consecutive number of reservoirs from which short canals, which would be managed by the village officials, would distribute the water.

The object of these weirs in the small rivers is—

- (a) To enable any flow in the river in seasons of drought to be used to prevent the rain crops dying by giving one or two waterings.
- (b) To provide a series of storage reservoirs, one below the other, thereby raising the sub-soil water and improving the wells.
- (c) To encourage wheat irrigation so that a certain area of crop will be protected permanently for each village over a large area.
- (2) To build automatic weirs in the large rivers such as the Krishna and Khima on the same principle as proposed for the smaller rivers, but large storage tanks to be built in the Ghats, the water from which will be passed down the rivers and picked up at intervals and distributed by canals.

The Revari canal in the Satara district is the nearest existing approach to the proposals for small rivers. The canal is 5 miles in length and irrigates 1,200 acres with a net revenue of Rs. 3,545.

The Krishana canal also in Satara is somewhat similar to the proposal for large rivers, it irrigates 5,000 acres with a net revenue of Rs. 28,974.

III.—Note on Irrigation on black soil.

As there is considerable variation in the opinions expressed on the possibility and value of irrigating black soil, the following suggestion is proposed as a possible reason for the differences of opinion.

The value of black soil for irrigation seems to depend not so much on the soil itself but on its depth and the underlying strata and also on the amount of water used.

For instance, in deep black soil say 8 feet deep or more as in Surat and Broach or in shallower soil say 3 feet deep but resting on clay, trap or any impermeable strata, irrigation can be used with great advantage from wells but not from canals.

With an almost unlimited supply as with canals the cultivators are inclined to use far too much water, the result being that the land gradually becomes water-logged, or as the Natives say, "cold" owing to the saturation of the lower layers which have no drainage and soon become a mass of cold wet mud. With well irrigation no more water is put on to the land than is required to mature the crop, as every extra cubic foot of water put on the land means extra labour for the cultivator in raising it from the well.

With shallow black soil resting on muram or other porous strata the case is different, the excess water from the canal supply soon soaks through the layer of black soil and is carried off by the porous underlying strata and the land is kept "warm" by the natural drainage, and water-logging is avoided. In the case of well irrigation only the amount of water required is put on to the land and therefore there is no fear of water logging.

As regards remedies:—Where it is considered advisable to protect deep black soil areas or shallow soil on impermeable strata, the only thing to be done appears to be to regulate very carefully the amount of water passed down the canal to the actual requirements. If the cultivators at the head of the canal take too much water there will not be enough for the cultivators lower down, and when once the latter recognise that the shortness of water is due to waste on the part of those higher up the canal, they may be trusted to apply their own remedies. No system of drainage would be feasible, the expense would be prohibitive and there would be too much interference with the private rights of individual cultivators.

The less the length of canal the easier it would be for the cultivators near the lower end of a canal to prevent waste of water by those higher up. With short canals of say 2 to 3 miles the village officials would be able to deal and put sufficient pressure on all offenders.

IV.—Note on the value of manure and the possibility of its supply for small irrigation works.

There appears to be great difference of opinion as to the necessity of manure if irrigation is to be made a success. The following is suggested as a possible solution. "Irrigation" is understood in quite different senses by different people. For instance, under Kharkwasla Canal near Poona the term means high class crops such as sugarcane and garden produce, for such crops not only is it absolutely necessary to manure the land to a high degree but also, in order to be successful, the cultivator must have considerable experience and know how best to grow and rotate the crops.

On the other hand with, "Irrigation," as applied to the protection of districts liable to drought, the term would more correctly be understood as—

- (1) The provision of canal or well water in order to compensate for deficient rainfall and so save the rain crops in seasons of droughts.
- or (2) The substitution of irrigated crops such as wheat and barley for the rain *juari* or *bajri* so as to save as large an area as possible of protected land.

As regards 1.—No more manure than is now used would be required. The crop dying for want of rain can be saved by giving canal water but this would not affect the crop on land in any other way. The substitution of canal water for deficient rain can cause no necessity for extra manure nor can there be any injury to the land as in ordinary years. The crop would have matured by the same amount of rainfall as the water given from the canal.

As regards 2.—The area of permanently irrigated crops will always be limited, but every village has a certain amount of manure, much of which is now wasted but which, with the certainty of a good paying crop, safeguarded from failure of rain, the cultivators might be laid to use to the benefit of the land.

The introduction of perennial crops will doubtless be very gradual but the manure question will probably solve itself. The large acreage of sugarcane round Poona and the rates paid there for water show to what advantage high class crops can be grown. If the acreage of sugarcane round Poona is compared with the population and the same percentages applied to any village with good irrigable soil it would appear that when once the cultivators recognise the value of perennial crops they are able to get over the difficulty about manure. Of course the circumstances at Poona are exceptional and it is not easy to explain the very high rates up to Rs. 50 per acre that cultivators are willing to pay for water there but it would seem to be to the interest of all concerned to try and make similar conditions in as many villages as possible.

Mr. E. O.
Mawson.

20 Dec. 01.

Mr. E. O.
Mawson.

20 Dec. 01.

1. Q. (*The President*).—You are Executive Engineer, Poona District?—Yes.

2. Q. We examined you at Rajkot?—Yes.

3. Q. You know something about the famine?—I was in Kathiawar during the last famine. My previous experience of famine was in Satara in 1896-97; we did not do anything there besides metal breaking.

4. Q. The District was hard hit?—Yes, especially in the ghat district. In 1896 there was too much water and the crops died from too much rain in the west of the district.

5. Q. But we heard that the people were perishing for the want of water?—Yes, in the eastern parts.

6. Q. Were you long at Satara?—1½ years.

7. Q. What, do you consider, are the wants of the district?—The Western part of the district requires nothing; but the Eastern part which adjoins Sholapur is always in a precarious state.

8. Q. Are there no tank works in Satara?—Yes, Mahswad tank which is the largest irrigates the Sholapur district.

9. Q. From your knowledge of the district what is the best thing to do for Satara?—The only thing is to try and store the water; the slope is rather steep and the water runs off quickly. This can be done by storage reservoirs or dams across rivers like the Krishna. The Krishna Canal irrigates 5,000 to 6,000 acres of land and it has a weir 20 feet high.

10. Q. This is not a storage weir, but only for raising the water?—Yes, but there is a certain amount of storage above the weir.

11. Q. There is a tank at Maini?—Yes, it was made in the 1876 famine.

12. Q. That is not dependent on the Ghats?—No.

13. Q. Do you know why it is not more used?—It is full of water, but the land under command is not very good.

14. Q. Is there a pretty good rainfall there?—Yes.

15. Q. (*Mr. Muir-Mackenzie*).—If it fills, why does it not pay?—The land is not good and the establishment charges are heavy.

16. Q. You have got to keep an Overseer or Assistant Engineer and their wages are charged to the tank because there is nothing else to charge it to?—Yes.

17. Q. But they also have charge of the roads?—But the larger proportion is charged to the tanks.

18. Q. (*Mr. Ibbetson*).—With the result that they do not produce revenue?—The establishment and repair charges swallow up the revenue.

19. Q. (*Mr. Muir-Mackenzie*).—You do get revenue out of the tank?—No, not when interest on the capital cost is taken into consideration in addition to establishment charges.

20. Q. (*Mr. Ibbetson*).—You seem to look upon it as an accepted principle that all the establishment charges should be charged to the tank. Is it a rule of which the principle has been laid down by Government?—I think it is a generally accepted rule to charge as much as possible to tank. The tank is Imperial and the roads are Provincial.

21. Q. (*The President*).—What is your advice about tanks?—I would suggest the building of more weirs, they do not silt up like storage tanks. The Krishna Canal pays fairly well.

22. Q. How much land can you irrigate from it?—About 5,000 acres.

23. Q. Will it stand more extension?—Nearly all the water is used up, we cannot extend the irrigated area much more.

24. Q. Are there no small rivers in the vicinity which you could draw upon?—I think a storage tank or two could be made.

25. Q. (*Mr. Rajaratna Mdlr.*).—On some of these works, the working expenses are much higher than the revenue. On the Upper Man river, the working expenses are Rs. 6,600 and the revenue only Rs. 5,000. We cannot get to the bottom of this, can you explain it?—It is chiefly due to the fact that most of the establishment charges go to tanks.

26. Q. Can you not reduce the establishment?—I don't think so.

27. Q. (*Mr. Muir-Mackenzie*).—Not in the whole of the district?—No.

28. Q. (*Mr. Rajaratna Mdlr.*).—I notice that three out of the five works do not pay their expenses?—Those are protective works.

29. Q. Could they not be made productive?—It is difficult to deal with the people in the Deccan. They will not take water as long as they can get a good rainfall, while you have to keep up your canal establishment always in good years and bad.

30. Q. Is much sugarcane irrigated under these works?—No, very little.

31. Q. In the Revári canal the total area is sugarcane? That is because it is close to Satara which is a large town and there is plenty of manure there.

32. Q. (*The President*).—What about the Yerla project mentioned in Mr. Beale's report at page 254?—I cannot give you any information.

33. Q. Are there many wells on these canals to supplement the irrigation?—No.

34. Q. (*Mr. Muir-Mackenzie*).—You are submitting, I understand, a memorandum on Deccan irrigation. You suggest that bunds should be made where you have perennial supplies in the rivers?—Yes, I think this would be advisable.

35. Q. They would not do as famine works?—No, then construction requires skilled labour.

36. Q. I expect that you could get the canal done with famine labour?—Yes, the canals, but not the weirs.

37. Q. Would there be no difficulty where the rivers run very deep?—No, in the Deccan District we might have 20 and 25 feet dams; the dam in the Kistna is 21 to 25 feet high.

38. Q. Is there no form of irrigation work you can propose as famine labour for extending or conserving the water supply. Say the terracing of the country with *tals*? The Deccan is not suitable for *tals*.

39. Q. You found tanks a very good kind of work in Kathiawar, why not in the Deccan?—The general slope of the ground is much greater in the Deccan than in Kathiawar, and the conditions are not so favourable.

40. Q. Were you quite satisfied, with the form of famine labour you did in Satara district?—I do not like metal breaking.

41. Q. What would you prefer to see done?—I would prefer anything to metal breaking.

42. Q. Is it difficult to break metal for road making?—Yes, the people's hands take fourteen days to get hardened and the metal must be collected in large heaps entailing extra cost for carriage.

43. Q. What better work is there for them to do?—I would rather see them terracing the country.

44. Q. (*The President*).—Do the land-owners readily consent to this?—I think they would.

45. Q. (*Mr. Muir-Mackenzie*).—Would you put the famine labourers on tanks?—Yes, if we could get good sites and the projects were already prepared. There were no projects prepared for Satara. You see the preparation of projects is rather an expensive item and to keep a programme ready requires a fairly big grant for survey alone.

46. Q. How much would it require for the whole Presidency?—More than three lakhs a year for three or four years.

47. Q. (*Mr. Ibbetson*).—Both you and Mr. Kemball, have spoken of metal breaking as a bad test of destitution, what is the objection to it. That the people do not like it, makes it one of the best tests possible?—It is almost impossible to get correct measurement. I think the Overseers always over-measure; they give credit for more than is really done. This is not the case with earthworks, which can be measured up in large quantities. The measurements for metal are of necessity for small amounts per worker, compared with earthwork, so that the excess measurement is cumulative. Earthworks are always easier to check.

WITNESS NO. 58.—MR. DAJI HARI RENAVIKAR, District Agricultural Inspector, Poona.

1. Q. (*The President*).—You are District Agricultural Inspector, Poona?—Yes.

2. Q. How long have you been in your present post?—About 18 months.

3. Q. Please give me your views about the irrigation of black cotton soil?—It can be irrigated, but the question is whether rice crops can be grown on it. Some cultivators think it can be, but the only difficulty is that it takes a great deal of water.

4. Q. There are many kinds of black soil. We have heard of some in Gujarat that will not take irrigation?—In the Poona district the black cotton soil is not too deep for irrigation and is not widely cracked and can be irrigated. I speak of well irrigation.

5. Q. Is it the custom here to irrigate the black cotton soil from wells?—Watered from the wells the crops yielded are good.

6. Q. Would it not be the same on the Nira and Mutha Canals; is there any difference in the water that comes from the canals and that which comes from the wells?—The agriculturists say that well water is more nutritious.

7. Q. There is no objection to tank irrigation?—No. The canal water is said to be cold. The fact is that the people over-flood their fields, and the result is injurious.

8. Q. If wells are dug close together, do they injure each other?—If two or more wells are dug in the same subsoil current there is some risk that the first well will run dry.

9. Q. How far apart should wells in your opinion be?—In one acre you may have two or three wells without injury to each other. In Mohari in the Nasik district I know a place where in an acre of land there were three wells.

10. Q. Were these wells worked in the season of drought without injury to each other?—Yes, but they had to be deepened. It is usual to dig deeper in famine years. In Poona the water surface has gone down 7 or 8 feet during the past few years.

11. Q. Would agriculturists be glad if they were given the use of boring tools?—They would not be able to work them.

12. Q. Do the people understand the advantages of takavi?—Yes, but it is hard to get the village *Kulkarni* to do anything unless he is on good terms with them.

13. Q. Could you suggest anything that would make the system easier?—There is a great interval between the time of application and the time of the grant. If the work is entrusted to Mamlatdars it would be done more quickly and there would be no trouble.

14. Q. Is there any complaint against the 5 per cent. interest charged by Government?—No, the rate is cheaper than the rate which Marwaris charge, which is 18 to 24 per cent.

15. Q. (*Mr. Rajaratna Mdlr*).—What are your duties as Agricultural Inspector?—I have to check the work of my subordinates in the disposition of boundaries. I test the inspection of crops in the books furnished, and see that the net area of crops as given is correct.

16. Q. Do you measure the area of crop under each well? The Circle Inspectors take tests.

17. Q. Are there cases in which the same area is cropped more than once in the season?—Yes.

18. Q. In your crop return do you show that area twice or once?—If two acres are under *bajri* and it is changed for *juari*, we show only two acres, but in the remark column we show two crops.

19. Q. (*Mr. Muir-Mackenzie*).—You show the acres cropped and the net crop area?—Yes.

20. Q. The acres cropped would be four and the net crop area two?—Yes.

21. Q.—What is the cost of an ordinary well?—An ordinary well costs about Rs. 300; a good deal depends on the depth at which water is found.

Mr. Renavikar.

28 Oct. 01.

TWENTY-FIFTH DAY.

Poona, 21st December 1901.

WITNESS NO. 59.—MR. E. L. CAPPEL, Collector of Poona.

Memo. by witness.

I have just returned from the revenue inspection of Indapur and Baramati talukas which are served by the Nira Canal. It was not intended that I should give evidence before the Commission, and I have, therefore, not got figures and details, and can speak only to the general results observed.

CANAL IRRIGATION.

2. *General Results*.—The irrigated villages paid the greater part of their revenue during the famine, and supported great numbers of labourers from outside. The rise in prices naturally brought very large profits to holders of irrigated lands. These villages show remarkable indications of prosperity, in an improved style of building and in the condition of stock, as well as in the appearance of the people and in the general presence of oil and sugar crushing machinery. Irrigation by canal at present rates is certainly much cheaper than irrigation by well, and wells in the canal commanded area are in fact not used, though full of water.

3. Instances of individual prosperity may be given. A large landholder who was in debt to the extent of about a lakh a few years ago, has now paid off all but about 10,000, although during the famine he has got nothing from his lands in another district which form the larger portion of his property. Another large landholder bought land when the canal was under construction. He was a *Kulkarni* by profession and is now one of the rich men of the district. A very noticeable instance of the general result is the increase of the population and wealth of Baramati town. The population of the town is now 9,400, and in 1831 was only 5,400. In this town there is no crime of any kind and very little elsewhere on the canal, although a considerable number of "Takaris"

and other criminal tribes are located in this tract. The condition of Indapur town offers a striking contrast. It may not be very criminal, but is certainly not free from crime, and the general appearance of the place is one of decay. It has decreased in population, and poverty is everywhere apparent.

Mr. E. L. Cappel.

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4. *Drawbacks*.—The canal irrigation appears to have the following drawbacks: it occasionally produces salt efflorescence, and there is an apprehension that it may exhaust the land owing to deficiency of manure. I have seen a good many patches of salt land, but not large in area, and this evil seems so far not to have done much damage. It is probably due to inexperience in the use of the water. The exhaustion of the land is merely anticipated and has not shown itself on any area I have seen. I believe this fear arises from experience gained on the Mutha Canal where a good deal of land has in places become unfit for use. But I think in these cases also abuse of the water was the cause, as I have generally heard a history of excessive soaking in connection with such land. Of the water-logging of any extensive tract I have never heard in those parts. I believe that these are minor difficulties and can easily be overcome by experience.

5. *Manure*.—The supply of manure is, of course, an important factor. There is at present some deficiency. Baramati cake is imported from Gujarat, night-soil is used to a small extent, and all kinds of expedients are resorted to. Earth from village sites is used and stable manure was brought in from unirrigated villages during the famine, which will probably now cease to be available. I have not heard of "San" being ploughed in the Southern talukas, but I have seen it grown as a green crop manure for well irrigation in Khed or Junnar. I see no reason to suppose that the present deficiency will not be remedied in course of time, or

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the use of water will be limited as experience shows the proportion to be used with the manure available. Much of the irrigated area is rich black soil which is naturally very fertile. At Baramati itself the Municipality is arranging for a latrine system and the system of drainage specially calculated to produce large quantities of night-soil and drainage manure, which is expected not only to benefit the land, but to bring in a handsome profit.

6. *Irrigation works as employment for famine labour.*—Irrigation works appear to me to be by far the best application of famine labour. The Snetphal storage tank for instance will, I believe, change the face of a large area of poverty-stricken country south of Indapur, and the labour expended upon it will be a permanent benefit to the people and a safeguard against famine just where it is most wanted. The making of roads has been overdone in this district. I have just travelled upon a road (Baramati to Patas) made during one of the recent famines at great cost, which is hardly possible now for bullock carts in places. The District Local Board has not sufficient funds to maintain any more roads and cannot keep up those it has. Roads produced no return, except in a very remote way, while any tank or canal which brings water on to land at least ensures revenue and provides labour for outsiders over a large area than that actually commanded. These items alone appear to me to make a strict calculation of direct profit and loss on irrigation works out of place. The indirect gain to the country can hardly be calculated. For instance, setting aside the great value of the produce under high cultivation and the fact that in bad seasons nothing at all would be grown, there remains the circumstances that almost all canal irrigated land in these parts is made to produce three crops instead of one, year in and year out.

7. *Wells.*—The question of wells is a very difficult one in the Deccan. In Poona an enormous amount of money (both tagai and private) has been lost owing to the digging

of dry wells. I have not formed a decided opinion as to why this is. The digging of trial pits is rarely resorted to, and the offer of Government to meet the cost, if water was not found, has not been put to use. There is a general impression that the water level in the east of the district is sinking owing to continuous deficiency of rainfall, and undoubtedly many wells which held good water when built are now dry or nearly so all the year round. In Indapur, Dhond and Bhimthadi, the Local Officers disapprove of the use of tagai for wells at present, owing to the extreme difficulty of finding water. I think that boring machines might be used with advantage: but this is rather an engineering question, as boring through the Deccan trap might cost more than making a trial pit. If it costs less I would lend the machine for nothing if water is not found, and would make only a small charge if water is reached. Boring in this way might be continued with a wide extension of the tagai system as there would be no hesitation about the well with water well ascertained.

8. *Tagai.*—The issue of tagai for wells and otherwise might be improved by the abolition of notice to call for objections, which seems to be unnecessary, and by the empowering of Mamlatdars as was done in the recent famine. And I think that if expedition and regularity in the disposal of tagai business is to be obtained, the establishment should be permanently increased. A 1 per cent. increase in the interest rate would cover this and would not be felt as a hardship. Anyhow the fact must be faced that a large agricultural banking business such as this cannot be imposed upon the ordinary Taluka establishment.

9. *Dams and Tals.*—There is no room in the eastern part of Poona for much protection by means of dams and talis owing to the small number of streams, the nature of the country and deficient rainfall. Work of this kind is largely carried out in the Western Division, but this division is not ordinarily exposed to famine.

1. Q. (*The President.*)—How long have you been Collector of Poona?—For six months. Before that, I was in Dharwar and Belgaum. I have been here in Poona before as an Assistant Collector and as Director of Agriculture. I know the eastern part of the district very well.

2. Q. Have you been there recently?—Yes, I have just returned from the Revenue inspection of the Indapur and Baramati talukas which are served by the Nira canal. I was much struck with what I saw there.

3. Q. You advance the novel suggestion that irrigation prevents crime; it is the first time that we have heard this advanced as one of the benefits of irrigation?—Yes, in Baramati there is no crime of any kind and very little elsewhere on the canal, although a considerable number of *Takaris* and other criminal tribes are located in that tract. The condition of Indapur town offers a striking contrast; it may not be very criminal, but it is certainly not free from crime and the general appearance of the place is one of decay. It has decreased in population, and poverty is everywhere apparent.

4. Q. Is it close to the canal?—It lies outside of the irrigation area. It is north of the Snetphal tank.

5. Q. If more water could go down the canal to Indapur, would the town come under the influence of it?—I don't know. Indapur is a town of only 3,000 souls; it is a decaying place.

6. Q. The canals occasionally produce salt efflorescence. Have you heard methods discussed for getting rid of it?—Yes, it is considered best to let the land lie waste for a few years. So far as can be ascertained salt efflorescence is always associated with too much soakage. If the land is left alone for three or four years and then irrigated lightly, the salt goes out of it.

7. Q. You have seen the salt plains of the Punjab?—Yes, we have nothing like that here, only a field or two at a time is affected.

8. Q. Have you tried draining the affected land?—The conditions are very different here to the Punjab and it is not thought necessary. The question of drainage hardly applies here.

9. Q. You allude to the supply of manure being deficient in Baramati, is fish manure used to any large extent?—I had not heard of it until I read an account of Mr. Morrison's evidence; I have no doubt that it is used.

10. Q. Have you seen much artificial manure used?—Yes, they use oil cake and night-soil, which they prepare. All kinds of expedients are resorted to to obtain manure.

11. Q. (*Mr. Muir-Mackenzie.*)—Are the people using sallow?—I have not seen it used.

12. Q. *Karany* cake?—They may use it for manure, but I know they give it to cattle.

13. Q. (*The President.*)—You say that a lot of money, both takavi and private; has been lost in digging wells where there was no water. Is it true that the local officers have gone so far as to say no more takavi will be granted?—The water level in the district is sinking and the rayats cannot be induced to dig trial pits. They all put their money on the opinions of native experts, or the local wizard.

14. Q. You say that the abolition of notices calling for objections should be done away with; what notices are those?—A notice calling for any objections against the making of a proposed well; as the land is charged with the improvement.

15. Q. In the case of a well, the charge is small and the improvement in the land pays for it?—The notice refers to wells on private property.

16. Q. You suggest that the establishment should be increased so as to have separate takavi officers, and that the interest charged by Government should be increased by 1 per cent. to cover the cost?—I throw that out only as a suggestion.

17. Q. But there are no facilities for the increase of takavi?—I think the abolition of the notice and an increase of establishment would improve matters.

18. Q. We were told by a large number of witnesses that if advances were made free of interest, and if the existence of water were first ascertained by making a trial boring it would stimulate well construction?—I think that the conditions of this district are hardly such as to ensure this. Takavi would be taken by the rayats, but it is doubtful what the results would be to Government. I think that if Government is to give the money free of interest, there should be some guarantee. If Government can find water, the grants might be given more freely.

19. Q. You recommend boring machines?—Yes, boring machines might be used with advantage, but that is rather an engineering question, as boring through the Deccan trap might cost more than making a trial pit. If it costs less I would lend the machine for nothing if water is not found, and for only a nominal charge if water is reached.

20. Q. (*Mr. Muir-Mackenzie.*)—But you would require a large number of machines?—Yes, but we could commence with one apparatus first and obtain more if the trial proves successful.

21. Q. (*The President.*) What course would you advise as the best to adopt to make the district able to withstand another famine?—An increase of canals like the Nira most decidedly, and irrigation tanks; but tank facilities are, I think, exhausted. If they are not exhausted, I would recommend them in preference to canals.

22. Q. You recommend the extension and increase of canals similar to the Nira, the supply of which is sure to be restricted?—I do not know what the engineering possibilities are. I know the Bhema never runs dry. It is entirely a professional question.

23. Q. (*Mr. Nigham.*) With regard to dams in the Western part, are they made by the people?—Yes, a good many in the Western part, but there are very few in the Eastern portion. They are of masonry built on rock beds.

24. Q. Is there scope for more works of that kind in that part of the district?—That part of the district is generally free from famine, but it was touched by it this time.

25. Q. I suppose it is a district of good rainfall?—Yes; it is a district of heavy rainfall.

26. Q. (*Mr. Ibbetson.*) You say that the offer of Government to make trial pits has not been taken advantage of; was the offer made known to the people?—Yes, the offer was made known. But it is not the custom of the people to dig trial pits. They prefer to go on the information they get from native experts and risk their money on it. I do not know of a single case in which the offer was accepted.

27. Q. If Government dug the trial pits, would they take takavi?—I think the idea of the trial pit is foreign to the people here; they might learn it in time.

28. Q. Is there no way to shorten that time?—They are unwilling to spend even Rs. 100 in trial pits.

29. Q. But, suppose Government lent the money, and the risk was not theirs?—They would not object to that.

30. Q. If the offer to dig for nothing was made, would the people take takavi if water is found?—The offer was made, but I have not heard of a single instance in which it was accepted.

31. Q. (*Mr. Muir-Mackenzie.*) You know the Dharwar District well; you have a considerable system of tank there?—Yes, in the south-eastern part of the districts, that part of the district is not affected by scarcity ordinarily. I do not know if it was affected in 1896.

32. Q. It was pretty severely affected in 1876?—Yes, but escaped in 1899, but we had to spend three lakhs of Local Fund moneys in the north-eastern part on famine.

33. Q. Would you like to see the system of tanks extended?—I think they would be very useful for all kinds of crops; they are of the greatest value in irrigating garden crops.

34. Q. Are they used for rice crops?—Yes, the people do irrigate rice crops from them in Hingoli and the Ghât districts on the western boundary.

35. Q. Were these tanks considerably out of repair when you saw them?—Yes, a great many were. It would be a good thing to put them in repair as soon as possible. The expenditure would repay itself.

36. Q. (*Mr. Ibbetson.*) How?—In improved efficiency; they now lose a great deal of water. It would give the rayats more water, and an increased area would be brought under cultivation.

37. Q. Government has now to remit revenue on land which has gone out of cultivation in that district?—Yes, but I cannot say the amount.

38. Q. Is the amount remitted very large?—The amount remitted at the present moment is not large.

39. Q. Do you think that the extension of tanks in Dharwar might be facilitated if they were given over to the Local Boards with the additional revenues due to the water?—I am not inclined to think that that would be a good way of managing them. I do not consider the Local Boards, the best agency for carrying out work of that kind.

40. Q. Do you mean that it should be done by the Public Works Department?—Yes, it would be better done by them.

There is a tendency for Local Boards to place their works in the hands of the Public Works Department. *Mr. E. L. Cappel.*

41. Q. You don't think it would be sufficient if the Public Works Department prepared the plans and the Local Boards carried them out?—I would prefer not to see that done.

42. Q. Supposing the Public Works Department executed them under the Local Boards, would the Local Boards want to be satisfied as to the revenue they would get? What interest would they get?—Most of the Local Boards have no money; the Dharwar Local Board has no funds; all its funds were exhausted in the last famine.

43. Q. With regard to takavi, would you like to see the number of instalments increased?—No, I think the number is already large enough.

44. Q. Would you have the instalments running up to 20 years with facilities for extension?—I do not think there is any necessity for an increase.

45. Q. We hear that one of the objections to takavi is the rigidity of the collection?—We could give facilities for extension of the payment of instalments.

46. Q. But why not do away with the instalments altogether?—There is no reason except that Government runs a certain risk and capital is locked up for a much longer time.

47. Q. Would the rayat in that case ever repay the money?—I was just going to say that he might not.

48. Q. (*Mr. Muir-Mackenzie.*) Why should he ever repay it if Government can find the money?—That is a question for Government to consider.

49. Q. Suppose we go so far as to say that Government should find the money and the rayat pay only the interest, but that we should allow the rayat to repay some part of the capital whenever he cared to do so?—I would like to see that tried, but at first experiments would be necessary. Supposing a dry crop rate is Rs. 2 and you build a well for Rs. 400 from takavi and irrigate two acres, and you charge a water rate of Rs. 2 per acre, the income would only be Rs. 4 per annum for the Rs. 400.

50. Q. Don't you think two acres a very modest estimate?—No, not in the Eastern Deccan. I think two acres is a fair average. A very good well might run to three acres.

51. Q. The number of acres taking the net cropped area is over three acres?—Yes, in the western district, but only two in the eastern. Our *pathasthal* rate is Rs. 8, but we could not expect more than half of that.

52. Q. If you give a man a loan, he will have to pay Rs. 5 per cent. interest; in the same way I don't see why you should not take Rs. 20 from him on the Rs. 400 advanced?—I think the idea an excellent one, and I would like to see it tried. We could find agriculturists here and there who would be willing to do this at once. It is quite a new principle to me, but I think they would take the loan on those terms.

53. Q. How long do wells last in this district?—They last for ever if the water lasts where the bottom is solid rock.

54. Q. In your experience have you ever had any difficulty in giving out the full amount allotted for takavi?—No, the amount might be increased. It depends very much on the interest taken by individual officers. The Assistant Collector and the Mamlatdar could issue an enormously large amount of takavi. The Mamlatdars should be given more power and more time. I should like to see them with more power to advance. I think they could be trusted to rise to their responsibilities.

55. Q. How far would you go?—I would give them the same power that they had during the famine; that is of granting loans up to Rs. 500. I think the thing is too large for European Agency; even the Assistant Collector must rely on the Mamlatdar, who, I think, could generally be trusted.

56. Q. I am afraid the Mamlatdars have not always come up to the scratch; have there not been some cases of grave suspicion?—Yes, that is so.

WITNESS No. 60.—SARDAR COOP GOOSWAMY MUDLIAR, of Poona.

*Extract from Memorandum by Witness.*Sardar
Coopco-
swamy
Mudliar.

21 Dec. 01.

Oil engines with pumps attached are considered very economical and useful for agricultural purposes. They are attended with no danger, and do not require the services of an expert to work them, as is the case with steam power. I have only lately put up an oil engine with a centrifugal pump by Messrs. Tangyes, of Birmingham, in my farm at Hadapsar. It is capable of irrigating about 4 acres per day

of 8 hours, the cost of oil daily used being about Rs. 4. I have not had sufficient trial and experience of the engine to say anything with certainty, but I have hopes that it will work satisfactorily. In connection with this I have received cordial advice and assistance from the Executive Engineer for Irrigation, who is watching even now with interest the progress I am making with my engine.

1. Q. (Mr. Muir-Mackenzie.) You own a considerable amount of land in this neighbourhood?—Yes, 100 acres.

2. Q. You have made some agricultural experiments?—Yes.

3. Q. What would you say is the ordinary cost of a well, 30 feet deep, in tolerably good soil?—Much depends on how soon you reach the supply of water.

4. Q. For a well that would supply one *mot* with no trap for 15 or 25 feet?—About Rs. 250.

5. Q. Is that not rather cheap?—No, the rayat would not build it strongly, but simply sufficiently well to serve his purpose. There are plenty of such wells which do not cost more than Rs. 250; only a portion of these wells are built up with masonry. With slight repairs they last more than 30 years.

6. Q. You mean such repairs as the rayat can do himself?—No, the carpenter and the bricklayer would have to be requisitioned.

7. Q. What interest has the rayat to pay to the sowcar?—It varies from 15 to 20 per cent. per annum. Seldom less than 15 per cent., even if the applicant is perfectly solvent.

8. Q. Would you be glad to see the interest of 5 per cent. charged by Government, lowered?—No; it is low enough, but the people are reluctant to take *takavi*. They would be glad, if the loan were given with certain assurances. They are afraid of borrowing from Government, as the State has great power over their lands. They prefer the sowcar, who is somewhat lax in the recovery of instalments. They do not expect postponements of instalments from the Government. They have difficulties in regard to payment at times, and they find the *bania* more lenient than Government, though he does charge heavy interest.

9. Q. Supposing the Government took only interest with no instalments of capital?—That would be a great relief. I do not think it would have the effect of making the rayat never pay back anything.

10. Q. Would it be necessary for Government to lower the 5 per cent.?—No, it is quite reasonable.

11. Q. You have seen a good deal of the Mutha Canal irrigation. Is it doing damage to the soil?—It generally does good; it is not the use but the abuse of the water that does harm. The people over-water. When they use too much water, they have to put in a large amount of manure. It does not water-log the soil, if it is judiciously applied.

12. Q. Would drainage be a remedy for water-logging?—Yes; I know a water-logged garden at Wadgaon which was sold by the Irrigation Department and improved later by drainage, and is now a valuable property.

13. Q. Does salt efflorescence result from over irrigation or from the character of the canals?—From too much irrigation.

14. Q. Do you think that the Canal Department can prevent the excessive use?—I think so. It would stop the cultivator from taking water if certain restrictions were made. If the restrictions are reasonable, they will prove beneficial.

15. Q. Can you tell us to what extent artificial manures are used on this side?—To a great extent, fish and oil cakes from Gujarat.

16. Q. Are they not using *Karanj* cake?—I do not know; no cultivators in my neighbourhood have adopted it to my knowledge.

17. Q. Do you think, if canal irrigation is largely extended, manure in sufficient quantities would be forthcoming?—Yes.

18. Q. Have you known any instances of villages at some distance from Poona where night-soil is being used?—I know only one or two instances. It is not general.

19. Q. (The President.) You recommend in your note that Government should go to the cost of digging wells; would you charge assessment on the wells?—I would not put it on for a certain number of years at the beginning, but I would charge it later.

20. Q. Do you think that Government should put up oil engines and pumps?—It would repay the cost. The daily expense of working 10 H.P. engine with a five-inch pump capable of irrigating 4 acres a day is only Rs. 4.

21. Q. Why should not the rayat do it and not Government?—The rayat has no money.

22. Q. (Mr. Rajaratna Mudaliyar.) You say oil engines and pumps should be put up by Government?—Yes, to lift water from rivers or canals to lands higher than the canal level.

23. Q. About the abuse of canal water, do you think that the rayat is ignorant of the fact that over-irrigation causes damage?—They might have a little knowledge, but the work is left to servants, and they are careless. They let the whole field fill up, and make no use of the distributing beds. The canal rules are thus frustrated.

24. Q. (Mr. Ibbetson.) It would mean more labour to lead the water from one bed to another?—Yes, they now allow the little beds to overflow.

25. Q. (Mr. Muir-Mackenzie.) They don't get water when they want it, and when they get it, they take all they can?—Yes, it is due also to the uncertainty of supply.

26. Q. (Mr. Rajaratna Mudaliyar.) You propose feeding the existing wells with canal water?—Yes, the rayats would pay, but what is wanted is that they should be dug by Government.

27. Q. Would Government be able to recoup itself by levying a water rate?—Yes.

28. Q. Do you think that application for water should be dispensed with?—No.

29. Q. You apply for water for one season, why not apply for it for so many years?—I think it would be a good plan, but there is an uncertainty of water-supply.

30. Q. Is there much delay in getting sanction for applications for water?—No, only in difficult cases, which have to be reserved for the consideration of the higher authorities. Ordinarily, it takes about a month. In urgent cases, a pass is issued by the Supervisor. The regular sanction of the Executive Engineer takes a month, but the pass can be obtained in six days.

31. Q. (Mr. Muir-Mackenzie.) Do you think the pass might be issued by an officer not so high as the Executive Engineer?—Yes, I don't think any harm would result from that.

32. Q. (Mr. Rajaratna Mudaliyar.) Do you know whether the rayats are in fear of enhanced assessment, if they dig wells?—Yes, they are always apprehensive, when they change a dry crop to a higher class crop.

33. Q. Is there not a rule prohibiting the raising of assessment on account of improvements?—Yes, but the rayats are not aware of it.

34. Q. (Mr. Ibbetson.) Have you ever taken canal water for your *rabi* crops?—Yes, I always have to lift my water. The canal does not come up to my land.

35. Q. Do you make your men take the water always or do you wait for the rainfall?—I always take the water: I never depend on the rainfall. When the ordinary cultivator sees that there are no rains, then he takes the canal water.

36. Q. (Mr. Muir-Mackenzie.) Do you get a superior crop by your method?—Yes, I increase the yield by one-fourth.

37. Q. Perhaps half?—Yes, it might improve by half.

38. Q. Do others do as you do?—These facilities cannot be had, unless the canal is close by, and, again, those who cannot afford to lift the water or pay for it must depend on the rainfall.

39. Q. (Mr. Ibbetson.)—On what soil do you grow crops?—Two-thirds is black cotton soil; the rest mixed. I have irrigated *rabi* crops in deep black cotton soil.

40. Q. How deep?—The depth is three feet, and lower down there is loose morum.

41. Q. Supposing the cultivator waited in the hope of rain in October, how long would it take for him to get

canal water, if he waited till the last moment?—It depends on the amount of water there is in the canal. If there is plenty of water, he would get it in 10 or 14 days. If the water is short, he might not get it at all.

42. Q. Then he might lose his whole crop?—Yes, they do suffer in that way sometimes.

43. Q. (Mr. Muir-Mackenzie.) What is the average area which a well, costing Rs. 250, will irrigate?—It will, with one *mot*, irrigate 3 or 4 acres of ordinary crops.

44. Q. What work does your pump do?—The lift of my engine is 30 feet (9 feet suction; 21 feet delivery). I

use it to irrigate all my land. The source of the supply is the canal water, which I collect in a tank. The total area irrigated by it is 20 acres.

45. Q. Do you use it for *bajri*?—Yes, when the monsoon is late.

46. Q. (Mudaliya Rajaratna Mdlr.)—What water rate do you pay?—I pay half rates, because I lift my own water.

47. Q. (Mr. Ibbetson.) What did your engine and pump cost?—It cost me Rs. 2,400, including erection, and the building cost Rs. 700 more.

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WITNESS No. 61.—HON'BLE MR. J. TATE, Chief Engineer and Secretary, Public Works Department, Bombay.

Witness said: I lay on the table before the Irrigation Commission two notes—one on the subject of the Provincialization of Irrigation Works in this Presidency, and another regarding the Provincialization of the establishment employed in certain districts. They are accompanied by copies of important letters and orders on the subjects referred to. Neither of these matters has been under the consideration of the Government of Bombay since I became Secretary; but I am prepared to give such further explanations as the Commission may require.

The witness then read the following note on the question of Provincialization of Bombay Irrigation Works:—

Between May 1884, when the Government of India addressed this Government on the subject, and March 1886 there was some discussion as to the Provincialization of Irrigation Works in Sind on which no final decision was come to, as the question merged in the more general one raised by the Government of India in their letter No. 1043, dated 28th May 1886. This was received in this Department with Financial Department endorsement No. 1772, dated 21st June 1886. While this was under consideration, the "Finance Committee" prepared a note on the subject of Provincialization of Irrigation, and this was sent to this Department with Financial Department No. 311 P., dated 21st October 1886. It appears from letter No. 4347-A., dated 10th October 1886, from the Government of India, paragraph 4, that this Government in the Financial Department addressed their letters Nos. 3667 and 3668, dated 3rd December 1886, in which disinclination was expressed to entertain the proposals for provincialization of both major and minor works, and therefore the question was allowed to drop.

In 1896 the Government of India again in their letter above quoted revived it with reference to works in the Deccan and Gujarat only, and offered certain terms. The Superintending Engineers were asked to submit forecasts of revenue and expenditure, a note was prepared in the Public Works Department, and eventually this Government in the Financial Department addressed the Government of India in letter No. 907, dated 26th February 1898, and they replied in their letter No. 1705-A., dated 15th April 1898, that they had no present intention of provincializing the Irrigation Works in the Deccan and Gujarat.

Accompaniments to above note:—

(1) Letter from the Officiating Under Secretary to the Government of India, Department of Finance and Commerce, to the Chief Secretary to the Government of Bombay, No. 1043, dated 28th May 1886.

In continuation of the letter from the Public Works Department, No. 531, dated the 5th March 1886, I am directed to inform the Government of Bombay that the financial failure of the Lower Panjhra River Works has been noticed by the Secretary of State in the following terms:—

"The history of this project is unfortunately only one of

* Kadva River Works.	a large number of records
Lakh Canal.	of the financial failure of
Jamda Canal.	Irrigation Works* under-
Mutha Canal.	taken by the Bombay
Ekrak Tank.	Government in the Deccan,

and it leads me to request that your Government should consider whether it may not be possible and desirable to relieve the general revenues from the charges that arise from the interest on the unproductive capital on works of this description, and debit them against the Provincial revenues of Bombay. In no other manner does it appear to me to be possible to bring home the responsibility which attaches to the advocacy of the outlay of borrowed funds on works which wholly fail to produce the returns which alone would justify such expenditure."

2. The Governor General in Council has had under consideration these remarks of the Secretary of State, and is of opinion that it would be advantageous alike to the Imperial and Provincial Governments if, at any rate, all the Irrigation Works in Bombay which have been classed as Productive were made Provincial. The Provincialization might take effect from the 1st April 1887. The Local Government would pay interest at 4 per cent. on all Capital outlay up to that date, this payment being taken into consideration in fixing the terms of the new Provincial contract. On all Capital outlay from 1st April 1887 the Local Government would pay interest on the usual terms, namely, at the rate of 4 per cent. a year on the whole past outlay and half the outlay of the year. The receipts from all the canals transferred would be wholly Provincial, and the increase of the receipts from those canals would be a set-off against the interest payments.

3. I am directed to request that you will be good enough to submit the proposal to His Excellency the Governor in Council, and furnish the Government of India with His Excellency's views on the subject with as little delay as the circumstances will permit.

4. I am also directed to invite attention to my letter No. 883, dated the 9th May 1884, and to request the favour of an early reply thereto, regarding the provincialization of the Irrigation Works in Sind.

(2) Resolution of the Government of India, Finance and Commerce Department (Accounts and Finance—Provincial Finance), No. 3654, dated 14th October 1886.

Read:—

Note by the Finance Committee on the Provincialization of Irrigation (with special application to the Punjab).

The present Provincial contracts have nothing intermediate between full acceptance of Provincial responsibility for an irrigation work and its being left entirely upon the Imperial account. The consequence is that, as an irrigation work can never be expected to be anything but a source of expenditure for some years after it is commenced, the Provincial Governments, if they undertake the construction at all, do so only on Imperial account, and have not the incentive to economy which arises from the introduction of more immediate Provincial interest.

2. The suggestion (for which we were indebted to Colonel Brownlow) which we submit to the Government of India is that the difficulty of provincializing such works can be surmounted by an arrangement upon a basis about to be described. The arrangement would be a special subsidiary one and not part of the regular Provincial contract, first, because it is obvious that its duration must be fixed on special considerations and may or may not be the same as that of the regular contract; second, because it must be a stipulation that the money allotted under the arrangement is appropriable only to the particular purpose defined and cannot be used for any other; and third, because it looks forward to a time when an accruing profit may be made available for Provincial purposes apart from, and in addition to, what would otherwise be the measure of the allowance to the Province.

3. The Province would then submit to the Government of India a project for an irrigation work, estimating the amount required for Capital construction year by year, and annual maintenance charges, both during construction and for a period not exceeding ten years from the opening of the canal, after the expiry of which period, according to the estimate, the revenue would be sufficient to meet both maintenance charges and interest on Capital. Upon this basis, the Imperial Government would undertake to furnish year by year the money required for Capital construction, but would meantime bear all revenue charges, including that for interest on Capital. At the term fixed (or,

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at the option of the Provincial Government, at any earlier date) the work would become either partly or wholly Provincial as the Government of India may decide.

4. It seems on the whole advisable that the responsibility for the interest, which accrues during construction and until the taking over of the work, should rest with the Local Government, and it can hereafter be determined whether these arrears of interest should be treated as a loan (as between Imperial and Provincial) and recovered by annual instalments, or should be added to the Capital account of the work.

5. We have discussed the general proposal with the Government of the Punjab, and have ascertained that the principle thus suggested will be cordially accepted, provided that an agreement can be come to in each case as to the figures on which a contract with the Provincial Government should be based. We, therefore, go on to deal with the question in detail as far as it applies to the Punjab.

6. Before any canals can be provincialized, the principle must be decided by which the revenue due to irrigation is to be distinguished from the land revenue proper. We are informed that in the Punjab a different system of calculation exists on every canal, and in one case the whole revenue is treated as irrigation revenue. Those questions will have to be settled between the Government of India and the Provincial Governments with the distinct object of putting an end to any financial doubt or dispute as to the share in the increase of land revenue which shall accrue to the Imperial or Provincial revenue; and it seems necessary that the method of calculation should be precise and should rest on facts easily ascertainable, and should not, as we believe is the case now in Madras, be merely a rough estimate.

7. For purposes of provincialization, irrigation works divide themselves into the following categories:—

A—Works for which separate Capital and Revenue Accounts are kept—

(a) of which the Capital Account is so far advanced that Revenue operations are in full working order, the remaining Capital construction being on such works as distributaries, which are calculated to bring in revenue immediately;

(b) which have not yet reached the above stage.

B—Works of which the Capital Account is not separate from the Revenue Account, that is, Capital operations are of comparatively small amount, and are almost obligatory as part of the maintenance of the work.

8. To the first category, A (a), belong, in the Punjab, the Western Jumna, the Bari Doab, and the inundation canals, except the Muzaffargarh inundation canal, which belongs to Class B.

9. Officials of the Punjab Government have suggested that there may be a little difficulty in provincializing the Western Jumna Canal, the revenue from which is liable to occasional fluctuations arising from the character of the season. We conceive that it may not be easy to settle with the Provincial Government the estimate of revenue and expenditure at which the canal should be transferred to Provincial; but we have the statistics of many past years upon which to base an average estimate for the future, and we do not find that the fluctuations have been larger in this canal than on those in the North-Western Provinces, which have been provincialized.

10. Canals of the Class A (b) are represented in the Punjab by the Sirhind Canal, the Lower Sohay and Para, the Chenab, the Sidhnai and the Swat River Canal. Of these there is as yet no revenue experience, and they can be provincialized only in the sense and under the system explained in paragraphs 2 and 3 of this paper.

11. Class B is represented by the Muzaffargarh Canal, of which the expenditure might be wholly provincialized if it is possible to provide for the separation of that part of the land revenue which is due to irrigation from the land revenue proper.

12. Since this note was printed, we have shown a proof to the Lieutenant-Governor of the North-Western Provinces, and the principle of the proposal has received from him the same cordial acceptance as it has from the Punjab Government subject to the same examination of the figures in each individual case. Sir A. C. Lyall has informed us that he doubts if the Betwa Canal can be provincialized as yet, since, though the main works and most of the distributaries have been completed, the canal has only been

opened for about ten months, and the data for estimating its future revenue are not sufficient. His Honour would, however, willingly consent to the construction of the Sarda Canal on the suggested terms and conditions.

ORDER.—Ordered, that copies of the note be forwarded to the several Local Governments (except Central Provinces and Assam) for an expression of their views on the subject, with special reference to the several classes of canals within their limits, and the possibility of applying to each of such classes the principles proposed by the Finance Committee.

(3) *Letter from the Government of India, Finance and Commerce Department, to the Chief Secretary to the Government of Bombay, No. 4347-A., dated the 10th October 1896.*

In paragraph 42 of my letter No. 4282-A., dated the 7th October 1896, it was stated that the Government of India propose to make Provincial in the new Provincial contract all irrigation works in Bombay proper and Gujarat, and that a separate communication would be made to the Government of Bombay. I am now directed to address you on the subject.

2. In a despatch No. 55-P. W., dated 17th December 1885, the Secretary of State commented on the financial failure of irrigation works in the Deccan and Gujarat, and requested the Government of India to consider whether it would not be possible and desirable to relieve the general revenues from the charges arising from the interest on the Capital outlay on unremunerative works, and debit them against the Provincial revenues of Bombay. These remarks of the Secretary of State were communicated to the Government of Bombay in this Department letter No. 1043, dated 28th May 1886, and it was stated that in the opinion of the Governor General in Council it would be advantageous alike to the Imperial and Provincial Governments if, at any rate, all the irrigation works in Bombay, which had been classed as Productive, were made Provincial. It was accordingly proposed that all irrigation works in Bombay classed as Productive should be made over to Provincial, the Provincial revenues being charged at 4 per cent. per annum on the total Capital outlay and the revenue derived from the transferred works being credited to Provincial as a set-off against the interest charges.

3. In October 1886, and before a reply was received from Bombay to the above letter, the Finance Committee, in reporting on the terms of the Provincial contract with Bombay for the five years from 1887-88 to 1892-93, recommended, in paragraph 205 of their report, the provincialization of all minor irrigation works in the Bombay Presidency, and the note was forwarded for consideration to the Government of Bombay with this Department letter No. 3686, dated the 14th October 1886.

4. These proposals for making Provincial the major and minor irrigation works in Bombay were discussed by the Government of Bombay in their letters Nos. 3667 and 3668, dated the 3rd December 1886, and for reasons stated in those letters that Government expressed their disinclination to entertain the proposals. Shortly afterwards there came a time of great financial pressure, and the Government of India were obliged in 1889-90 to levy a special contribution of 17½ lakhs from the Bombay Provincial revenues. The question of the provincialization of the irrigation works was allowed to drop.

5. The Governor General in Council is convinced that it will now be advantageous to effect the provincialization on the general principle of vesting the Local Government with a more direct financial interest in works which are practically under its own control.

6. It is not, however, proposed to include Sindh in the arrangement,—irrigation works in Sindh are now in a transition state,—and for some time to come the expenditure is likely to be heavy and irregular, whilst the revenue prospects are very uncertain. The question is also too closely mixed up with the land revenue of the Province, which cannot be wholly provincialized.

7. In the Deccan and Gujarat the condition of affairs is different. The main works are practically complete and the revenue has attained a stage of fair stability. Subject, therefore, to any observations which His Excellency the Governor in Council may desire to make, the Government of India propose to make provincial the whole of the direct revenue and expenditure (including interest on capital) connected with major and minor irrigation works in Bombay proper and Gujarat.

8. The revenue and expenditure figures for these works for the five years, 1892-93 to 1896-97, are as follows :—

Major Works.

In thousands of rupees.

	1892-93.	1893-94.	1894-95.	1895-96 Revised	1896-97, Budget.
Direct Receipts . . .	4.43	4.48	4.38	4.73	5.34
Working Expenses . . .	2.03	1.87	2.04	1.82	1.88
Net Revenue . . .	2.40	2.69	2.44	2.91	3.46
Interest . . .	7.04	7.13	7.21	7.26	7.30

Minor Works.

Direct Revenue . . .	77	93	93	1.07	1.01
Revenue Expenditure . . .	2.42	3.13	3.85	3.05	4.41
Net Revenue Charge . . .	1.65	2.20	2.75	1.98	3.40
Capital Expenditure . . .	65	1.54	92	44	79
Total Net Charge . . .	2.30	3.74	3.67	2.12	4.19

9. For the purpose of calculating the assignment to be made to provincial revenues in the new contract, the Government of India propose to leave out of account the budget estimates for 1896-97 (which contain some altogether special features), and to take the average of the last three years under all heads except capital expenditure on minor works. In recent years this capital expenditure has consisted principally of the outlay on the Mutha Canals and other major works which have failed to fulfil the conditions of Productive Public Works. These works have virtually been completed, and in the opinion of the Government of India a total assignment of Rs. 2,00,000 will be sufficient to meet the requirements for capital expenditure during the five years of the new contract. The net assignment to be made to Provincial revenues in the new contract would therefore be Rs. 7,26,000 made up as follows :—

Major Works.

	Rs.
Direct Receipts	4,56,000
Working Expenses	1,91,000
Interest	7,20,000

Minor Works.

Revenue	98,000
Expenditure	3,69,000

The interest charge will be really somewhat in excess of Rs. 7,20,000, but on the other hand it is assumed that with the outlay of the capital on which the excess is charged the net revenue has also increased since 1894-95.

10. I am to request that the Government of India may be favoured with the views of His Excellency the Governor in Council on the proposals in this letter.

(4) *Note by the Secretary to Government, Public Works Department, dated 7th January 1898, on the Provincialization of Irrigation Works in the Deccan and Gujarat.*

The Government of India have decided that it is now expedient to provincialize all Major and Minor irrigation works in Bombay proper and Gujarat, and have forwarded, for any remarks this Government may wish to make, the considerations and calculations on which they have based the assignment they propose during the new provincial contract.

2. I read the Government of India's letter to mean that the principle has been finally settled, but that they are willing to consider any observations which His Excellency the Governor in Council may wish to make on their proposals for giving it effect.

3. The Government of India offer Rs. 7,26,000 annually during new contract. In the first place, it is necessary to have a clear understanding of what this Government are expected to do for this sum. I take the offer to mean that for the future the Government of India divest themselves of all interest in or liability for Major and Minor irrigation works as they stand at present in the Deccan and Gujarat : that during the new contract they will give nothing more for, and take nothing from, existing Irrigation works, Major or Minor.

The proposal does not to my mind preclude this Government from applying to the Government of India for funds for well-considered and duly sanctioned projects for new works under 35—Protective or 49—Productive. For minor works, however, I understand that provincial expenditure is limited, and that during this contract no further demand under this head is expected to be made.

4. I may now proceed to examine the offer of the Government of India, and its effect on our Establishment charges is the first thing to be considered. The Examiner of Public Works Accounts has deduced from the details of assignment offered by the Government of India that it contains an item amounting to Rs. 2,32,600 for establishment charges. The actual cost of Irrigation Establishment for 1895-96 was Rs. 2,13,000, and the average of previous three years comes to Rs. 2,56,000. The charge for Establishment depends on the expenditure, and if this Government accept the assignment offered as containing sufficient provision for expenditure, they may also be satisfied that Provincial Funds will not suffer as regards Establishment charges. The yearly expenditure during new contract is not likely to exceed that of 1895-96 or to approach the average of three previous years. So I think it may be taken that Provincial interests as regards Establishment are sufficiently safeguarded. Further, under the new contract, the Nasik and Nagar districts, now classified as Imperial, will become Provincial, and it is probable that we shall be able to carry out Provincial works in these districts at a smaller charge for Establishment than that now paid to the Imperial Government.

5. The Government of India deal with direct Revenue and Expenditure, and base their calculations on the actual figures of two years 1893-94 and 1894-1895 and on the figures of revised estimate for 1895-96. They offer to Provincial Government a yearly assignment of Rs. 7,26,000 made up as follows :—

Major Works.

	Rs.
Direct Revenue	4,56,000
Expenditure—	
Capital	Nil.
Revenue	1,91,000
Interest	7,20,000
	<hr/>
	9,11,000

Minor Works.

Direct Revenue	98,000
Expenditure—	
Capital	40,000
Revenue	3,29,000
	<hr/>
	3,69,000
	<hr/>
Total Expenditure	12,80,000

Deduct—

Total Revenue	5,54,000
	<hr/>
	7,26,000

6. In order that we may judge how far this offer is likely to meet our requirements for the remaining years of the new contract, I have had forecasts made, and the results are shown in the following statement, which shows, under each item, the Government of India's offer, the forecast

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Mr. John Tate. and the average of the actual expenditure and Revenue of five years ending 1896-97:—

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	Government of India's offer.	Superintending Engineer's forecast.	Average 5 years actual.
<i>Major Works.</i>			
Direct Revenue	Rs. 4,56,000	Rs. 5,31,758	Rs. 4,45,960
Expenditure			
Capital (35)	NIL	1,24,270	176,315
Revenue	1,91,000	2,10,815	1,99,407
Interest	7,20,000	7,43,606	7,18,630
TOTAL	9,11,000	10,78,691	9,94,352

* Includes expenditure on Chankapur Tank and the Nira Canal. The Schedule of Demands for 1898-99, however, provides Rs. 4,970 for the Mhaswad Tank. Shetphal Tank has also been left out. The estimate for this project is being revised, but the amounts of the estimates formerly received were Rs. 5,37,240 for direct charges and Rs. 31,666 for indirect charges. A total expenditure of Rs. 2,34,891 has been incurred under '33.'

† Expenditure principally on the Nira Canal.

	Government of India's offer.	Superintending Engineer's forecast.	Average 5 years' actual.
<i>Minor Works.</i>			
Direct Revenue	Rs. 98,000	Rs. 1,05,704	Rs. 92,237
Expenditure—			
Capital	40,000	1,87,824	176,298
Revenue	3,29,000	4,68,604	3,10,452
Total	3,69,000	6,06,428	3,86,750
Total Expenditure	12,80,000	16,85,119	13,81,102
Deduct—			
Total Revenue	5,54,000	6,37,462	5,38,197
Total	7,26,000	10,47,657	8,42,905

* Greater part for Bakh Reservoir and Kadwa River Works and the balance for Khari Cut, Mutha Canals, Ashti Tank and Yerla River Works, etc.

† Principally on the Mutha Canals; part on Yerla River Works, Lower Panjhra, Kadwa, Janda, etc.

Taking the items in order—under Major Works, the Government of India take direct Revenue at Rs. 4,56,000. The forecast gives it as Rs. 5,31,758, and the actual yearly average is Rs. 4,45,960.

1892-93	Rs. 4,42,460
1893-94	4,43,871
1894-95	4,48,288
1895-96	4,71,483
1896-97	4,21,721
	5) 22,29,803
Average	4,45,960

The figures given in the forecast are in excess both of Government of India's offer and of actual receipts, and appear to be based on the supposition that increased water-rates will be levied on those works. The revenue for 1897-98 will approach Rs. 5,20,000, and the estimate for 1898-99 comes to Rs. 4,96,000. We cannot hope that the revenue of 1897-98, an exceptional year, will continue, but I think we may fairly count on a steady increase up to the figures taken by Government of India. But I am not satisfied that this Government would be justified in accepting the Government of India's estimate of revenue as likely to be reached and permanently assured during this contract. The actual receipts for 1896-97 were only Rs. 4,21,721. I think we may count on a small permanent increase in time, but the figures for last five years, which are 442,446, 448,471, and 421, do not seem to me to warrant the conclusion that we shall have an average of 456 during the new contract. I would suggest, therefore, that the Government of India be asked to reduce the item to Rs. 4,50,000, which is, I think, the highest average we can hope to attain within the next few years.

7. For Capital expenditure on Major Works the Government of India propose to give nothing. This expenditure comes under two heads:—

35.—Protective Works.

49.—Productive Works.

Under the latter it is not probable that any expenditure will be required, but under the former some Rs. 25,000 will be wanted during the five years of new contract. This sum is small, and it is for consideration whether the Government of India should be asked to increase the assignment by Rs. 5,000, or we should trust to being able to provide the necessary funds or be content with the work as it is. On the whole, I do not think it necessary to raise any objection on this account. There are other works under this head, such as the Chankapur and Maladevi Tanks in abeyance, the Shetphal and other works commenced during the late famine, which it may be desirable to complete as Protective works, but which I do not understand as coming within the scope of the present proposals, but to be prosecuted on their merits from funds to be provided from Famine Insurance Fund when projects have been approved and sanctioned. I think therefore that we may accept the proposal to incur no capital expenditure on existing major works, as it cannot be said to be necessary, and would in most cases be throwing good money after bad.

8. For revenue expenditure on Major Irrigation Works the Government of India offer Rs. 1,91,000 against the forecast of Rs. 2,10,815 and the actuals Rs. 1,99,407. We are asked to take some Rs. 8,000 less than the average and Rs. 19,000 less than the forecast. The figures of the forecast are largely based on increased cost of revenue management due to the high forecast of revenue. It is not probable that special expenditure of any kind will be incurred which does not promise a return more than sufficient to cover extra cost of maintenance. During the last five years the revenue expenditure has varied from Rs. 1,76,844 to Rs. 2,25,882, and the average of the three years taken into account by Government of India, taking actuals for 1895-96, comes to Rs. 1,89,461. Considering then that capital expenditure has ceased and no special expenditure is likely to be incurred which will not more than pay for the increased cost of management, I think the Government of India's offer of Rs. 1,91,000 may be accepted as a fair average.

9. The next item of expenditure is for interest charges which the Government of India take at Rs. 7,20,000, being the average payment on this account for three years 1893-94 to 1895-96. In the first place, the interest charge is a steadily increasing one, while capital expenditure is being incurred, and the average of any previous number of years must be lower than the charge for the last year which remains permanent, provided capital expenditure ceases.

The figures for the three years taken by the Government of India are as follows:—

	Rs.
1893-94	7,12,563
1894-95	7,21,399
1895-96	7,28,438
	Average Rs. 7,20,000

These, as explained, show a steady increase, the amount of which in each year depends on the expenditure of the preceding one.

In 1896-97 the charges for interest amounted to Rs. 7,23,339, and the budget figures for 1897-98 are Rs. 7,30,000. In future the amount of this charge will not fall below that of 1896-97, viz., Rs. 7,28,339, but will exceed it by the interest on Capital expenditure in that year and while such expenditure is being increased.

It may be taken that this expenditure has now practically

1 The Revised Estimate of Capital expenditure for 1897-98 is Rs. 30,600, which at 4 per cent. will bring charge for interest hereafter to Rs. 7,29,619: there will probably also be some additional charges under 43, which will bring the total up to, if not over, 7,30,000.

	Rs.
1892-93	77,002
1893-94	83,344
1894-95	92,517
1895-96	80,008
1896-97	1,02,255
	5) 4,01,196
Average	80,237

ceased, but I cannot see on what ground this Government can be asked to take less than they will actually have to pay, which will be more than Rs. 7,28,339 † and probably about Rs. 7,30,000, which I think should be asked for.

10. Coming now to minor works, the Government of India take the revenue at Rs. 98,000, against a forecast of Rs. 1,05,704, and actual average receipts of Rs. 92,237. The figures of the revenue forecast appear to be based on supposed increase of rates, which is at least doubtful during

new contract. The Government of India arrived at their figure of Rs. 98,000 by taking actuals for 1893-94 and 1894-95 and those of revised estimate for 1895-96 as follows:—

	Rs.	
1893-94 . . .	93,000	} Actuals.
1894-95 . . .	93,000	
1895-96 . . .	1,07,000	
		Revised Estimate.
3) 2,93,000		
	97,666 or	
	98,000	

The actual receipts for 1895-96 were only Rs. 96,000, so that the average of the three years comes to Rs. 94,000 instead of 98,000 offered. Had the Government of India the actuals for 1895-96 before them, they would probably have taken the lower average of Rs. 94,000, and as these works are scattered, many of them, small, of uncertain supply, and liable to damage from various causes, I think we cannot safely reckon on an average exceeding Rs. 94,000 and that the Government of India should be asked to increase their assignment by the Rs. 4,000 here indicated.

11. For Capital expenditure on Minor works we are offered Rs. 40,000 a year, and although this is considerably below the forecast and actual figures, I think it will suffice for all our requirements for the five years of the new contract. The figures of the forecast are largely made up of proposed expenditure on Bokh Reservoir and Kadwa River Works. As regards the former, the Government of India have already refused to have anything to do with it; it has been under discussion for years, and I do not think there is any chance of its coming up for practical consideration within this contract. As regards the Kadwa River Works, the case is different. Some Rs. 5,40,000 have already been expended from an estimate of Rs. 5,85,274 sanctioned by the Government of India. A revised estimate is now under preparation, and had it not been for the famine, would have been ready before this. If on receipt of this estimate it is thought advisable in the interest of work done to complete this project, I think it only fair to ask that the money (probably about 1½ lakhs) should not come out of the contract assignment now proposed, but be granted by the Government of India, as this expenditure has not been taken into account in framing their proposals.

	Rs.	
1892-93 . . .	2,41,805	} expenditure on Minor works for which the Government of India propose to give Rs. 3,29,000 against our forecast of Rs. 4,68,604, and an average expenditure for five years of Rs. 3,10,452. The total of the forecast is made up as follows:—
1893-94 . . .	3,12,830	
1894-95 . . .	3,67,051	
1895-96 . . .	2,75,199	
1896-97 . . .	3,56,366	
5) 15,52,262		
Average . . .	3,10,452	

	Rs.
Northern Division . . .	7,67,802
Southern Division . . .	9,47,943
Central Division . . .	6,27,275
5) 23,43,020	
Average . . .	4,68,604

The figures for Northern Division may safely be reduced to Rs. 5,00,000 by omitting proposed expenditure on drainage and reclamation works, which in the first place are not connected with irrigation, and, moreover, are not likely to be commenced within this contract. In the Southern Division the Superintendent Engineer proposes a very largely increased expenditure on old tanks. I do not think there is any probability of our being able to spend much more than we have been doing, at least during the next three years, and by reducing the forecast to Rs. 6,10,000 we leave sufficient for our requirements. The forecast for the Central Division may be taken pretty nearly as it stands at Rs. 6,20,000. Our requirements then are—

	Rs.
Northern Division . . .	5,00,000
Southern Division . . .	6,10,000
Central Division . . .	6,20,000
5) 17,30,000	
Average . . .	3,46,000

or an average of 3,46,000 for the five years. This sum is based on estimates more or less untrustworthy, and considering that we have only been able to spend Rs. 3,10,452 on an average during the last five years with the Government of India to draw on, I am inclined to think what they offer now will be as much as we can profitably spend during new contract.

13. To sum up, I think the figures for expenditure taken by the Government of India are fair and will admit of the works being kept in fair order and allow of their operations being extended as far as it is probable that this Government would be able or prepared to go within the period of new contract. As explained in paragraph 9, it will be necessary to ask for an addition of Rs. 10,000 to the item allowed for interest charges, and I think the Government of India have taken rather a sanguine view of the revenue both from Major and Minor Works, and one which I think, with the actual figures for 1895-96 and 1896-97 before them, they will readily see the necessity for modifying. As explained, I would suggest that the revenue from "Major Works" be taken at Rs. 4,50,000, and that from "Minor" at Rs. 94,000, which will have the effect of increasing the proposed assignment by Rs. 10,000 and bringing it up to Rs. 7,36,000, and this with the Rs. 10,000 extra for interest charges will bring the total assignment to Rs. 7,46,000, which I consider is required to make the proposal fair and safe for this Government. I would also suggest that the position of this Government as regards the Kadwa River Project and the undertaking of whatever new works under "35-Protective" or "49-Productive" may be found to fulfil the necessary conditions after full investigation be clearly defined. I have one more remark to make regarding drainage works in Gujarat, for which large expenditure was proposed in Superintending Engineer's forecasts. These works have been very successful so far, but they are in no way connected with irrigation, being in reality land improvement works. From past experience I anticipate there would be no great difficulty in getting future expenditure classified as productive and funds provided under "49"; in any case, it seems to me that the charges should be against Land Revenue and not Irrigation.

(5) *Letter to the Government of India, Finance and Commerce Department, No. 907, dated 26th February 1898.*

With reference to your letter No. 4347-A., dated 10th October 1896, in which proposals are made for the provincialization of all irrigation works in the Deccan and Gujarat, I am directed to request that you will be so good as to state, for the information of this Government, whether the decision which the Government of India have arrived at in regard to the terms of the provincial settlement for the remaining four years of the current quinquennial period and which has been communicated in your letter No. 711-A., dated the 10th instant, extends to the irrigation works in the Deccan and Gujarat. I am to state that His Excellency the Governor in Council is now prepared to examine the proposals in detail, but that in the present financial circumstances he would prefer not to undertake a new service under somewhat speculative conditions. I am to observe that the direct revenue by no means represents all the profit to Government of these irrigation works. In many places the income is in the shape of consolidated assessment, which is credited entirely as land revenue, and where there is an assured supply it may be expedient to extend this system, which gets rid of many administrative difficulties. Even where there is no increase of assessment at all on account of water advantages, land below tanks benefits from the raising of sub-soil water and the facility of making serviceable wells, and the revenue from it is thus secured. In these circumstances, as land-revenue is mainly Imperial, it is appropriate that the expenditure on works which so greatly affect it should be also Imperial. The Government of India recognize that this principle should be applied in Sind, and the connection of the irrigation works with land revenue in Gujarat and the Deccan differs only in degree from such connection in Sind.

2. If the Government of India decide that this Government should proceed with the consideration of the provincialization scheme, it will be necessary to settle what arrangements are to be made for the completion of the protective works which have been begun as famine works. This Government cannot, of course, provide the necessary fund under the existing form of settlement, and as the remarks

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above made would especially apply to them, the provincialization even of maintenance and interest charges after completion of the works would be of doubtful propriety. The provision of the capital is certainly a matter of famine insurance, and should, the Governor in Council considers, be made as such.

(6) *Letter from the Under Secretary to the Government of India, Finance and Commerce Department, No. 1705-A., dated 15th April 1898.*

I am directed to acknowledge the receipt of your letter in the Financial Department, No. 907, dated the 26th February 1898, and in reply to say that the Government of India have no present intention of provincializing the irrigation works in the Deccan and Gujarat, and that the decision contained in the letter from this Department, No. 711-A., dated the 10th February last, does not extend to these works.

1. Q. (Mr. Muir-Mackenzie.) The disinclination to settle the question of provincializing the irrigation works was due, I believe, to the fact that we were just beginning the Famine of 1896?—I do not doubt that, but the reasons given were that the financial position of the Government was such that the proposal had to be shelved. The facts are set out in paragraphs 2 to 4 of the letter from the Secretary to the Government of India, to the Chief Secretary to the Government of Bombay, No. 4347, dated 10th October 1896. The letter is attached to my note.

2. Q. There was the difficulty also, I believe, of revising the Provincial Contract at the time?—Partly that, but there was also the question of establishment. The matter has not come up for discussion in my time.

3. Q. (The President.) What is your own personal view on the question?—I think it is more a question for the Finance Department than for the Public Works Department. We have no difficulty in getting funds from the Government of India. That Government is always liberal. So far as works are concerned, there is no difficulty in getting funds for improvements, if fair reasons are given. Leaving the financial question out of consideration, the present arrangement is best for the works, as we can get all the funds we want. They are better maintained, probably than they would be, if the Government of Bombay had to find the money out of limited funds.

4. Q. (Mr. Higham.) The Government of Bombay is just as likely to give money as the Government of India, if it can be spent profitably?—Yes, just as likely, if they had it to give.

5. Q. (Mr. Muir-Mackenzie.) In regard to civil roads, which are Provincial, the grants are as liberal as Government can make them, are they not?—Yes, I have no apprehension that the Department will be less favourably treated if provincialization takes place.

6. Q. (The President.) Are there any irrigation works in this Presidency that are treated as Provincial?—Yes, one, the Gokak Canal, but the conditions of this are peculiar.

7. Q. How are Productive and Protective works distinguished?—Productive works constructed from loan funds; Protective works are from Government of India money.

8. Q. And the fact that the works are Imperial leads to anomalous establishment charges?—Yes. With the permission of the members of the Commission, I will read the note I have prepared on the Provincialization of establishment charges.

The witness then read the following note on the Provincialization of Establishment and Mode of distributing Charges:—

The provisions which regulate this are contained in paragraphs 2119 and 2120 of Volume II of the Public Works Department Code. The nature and extent of the application of these rules are explained in Government Resolution No. 1903 dated 14th December 1894.

In their Resolution No. 316-31—A.I., dated 21st September 1879, the Government of India sanctioned certain rules for apportionment of establishment charges. By Government Resolution No. 454, dated 15th September 1879, certain additions were proposed to meet the special exigencies of this Presidency, and the approval of the Government of India was applied for in letter of the same number and date. The Government of India declined to make any change in the rules. A further communication was addressed to the

Government of India, No. 631, dated 24th December 1879. That Government then asked for further information, but no communication appears to have been made.

In 1887 "Irrigation" as a separate Department was abolished. The effect of the orders regarding treatment of certain districts as Provincial and Imperial was considered, and as a result orders were issued to the Examiner in memorandum No. M-38, dated 10th July 1889, in which the following divisions and districts were treated as Imperial:—

Divisions.	Districts.
Sind .	All in Sind.
Central .	Poona Irrigation. Nira Canal (since abolished). Khândesh Irrigation. Ahmednagar. Násik. Belgaum and Dhárwár (now Dhárwár Irrigation).

The proposals of this Government were approved by the Government of India in their letter No. 1978, dated 9th July 1889. The Government of India, in their letter No. 145 A. G., dated 8th September 1893, pointed out that the amounts charged to Imperial Irrigation in the Ahmednagar and Násik districts under the above arrangements were abnormally high, and enquired whether the classification of the districts should not be changed from Imperial to Provincial.

The matter was considered and this Government addressed to the Government of India letter No. 1289, dated 14th August 1894, in which it was proposed to provincialize the office of the Superintending Engineer, Central Division, along with the two districts referred to, and it was suggested for the consideration of the Government of India that an additional annual grant of Rs. 30,000 to Provincial should be made.

The Government of India asked for some further information, which was given in this Government letter No. 1925, dated 19th December 1894. Certain further information was also furnished with letter No. 538, dated 21st March 1895. No reply from the Government of India has been received, and the Districts and Divisions referred to are still classed as Imperial.

A statement showing the actual cost of Establishment under all heads for the ten years ending 1900-1901 is attached with copies of the important letters mentioned in this Note.

Accompaniments to note:—

(1) *Statement showing the total Outlay under all heads and total Charges for Establishment with percentages for the last ten years.*

Year.	Total Outlay excluding suspense heads.	Total Charges for Establish- ment.	Percentage.
	Rs.	Rs.	Rs.
1891-92 . .	69,86,721	17,59,349	25.20
1892-93 . .	63,23,615	18,18,828	28.80
1893-94 . .	66,82,441	19,26,203	28.82
1894-95 . .	68,92,076	20,01,062	29.03
1895-96 . .	77,34,978	20,20,515	26.00
1896-97 . .	81,85,957	19,91,652	24.33
1897-98 . .	72,49,293	19,29,833	26.62
1898-99 . .	67,06,903	19,55,489	29.16
1899-1900*	68,15,050	19,84,323	29.12
1900-1901*	74,40,616	20,76,378	27.91
Average . .	...	...	27.5

* Excluding "Famine Relief."

(2) *Letter from the Secretary to the Government of India, Public Works Department, to the Secretary to the Government of Bombay, Public Works Department, No. 145 A-G, dated the 8th September 1893.*

In forwarding herewith a statement showing the distribution of the cost of executive establishment in the Ahmednagar and Nasik divisions for the five years ending with 1893-94, I am directed to observe that, owing to the fact that these divisions are classed as Imperial divisions, the amounts chargeable to Provincial and Local Funds on account of establishment (inclusive of Direction and Accounts) are calculated at 23 per cent. on the outlay on works and repairs in accordance with Public Works Department Code, Volume II, Chapter XV, paragraph 132, the balance of the establishment charges after deducting the share chargeable to Imperial Military Works, Civil Works and Barrack Department, being debited to Imperial Irrigation. The amounts so charged to Imperial Irrigation Works are abnormally high, the percentage on works

of executive establishment only often exceeding 150 per cent.

2. When the proposal for the amalgamation of the Ahmednagar and Nasik Provincial districts with the Irrigation districts and their classification as Imperial was approved in Public Works Department letter No. 1978-G., dated 9th July 1889, the Government of India did not anticipate the anomaly of establishment charges in a division in which Provincial and Local Fund expenditure predominates being distributed so unequally, that the percentage on Imperial Irrigation expenditure on works and repairs would amount to over 150 per cent., while that upon Provincial and Local Fund expenditure remains at 23 per cent. only. I am directed to request that the Government of Bombay will report upon the question and consider whether the classification of the divisions in question should not be changed from Imperial to Provincial.

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Accompaniment to Government of India letter No. 145-A.G., dated 8th September 1893.

Statement showing the distribution by funds of the cost of Executive Establishment in the Ahmednagar and Nasik Divisions for five years ending 1893-94 and the percentage it bears to the outlay on Works and Repairs.

	ACTUALS, 1889-90.			ACTUALS, 1890-91.			ACTUALS, 1891-92.			REVISED ESTIMATE, 1892-93.			BUDGET ESTIMATE, 1893-94.		
	Outlay on Works and Repairs.	Cost of Executive Establishment.	Percentage.	Outlay on Works and Repairs.	Cost of Executive Establishment.	Percentage.	Outlay on Works and Repairs.	Cost of Executive Establishment.	Percentage.	Outlay on Works and Repairs.	Cost of Executive Establishment.	Percentage.	Outlay on Works and Repairs.	Cost of Executive Establishment.	Percentage.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
AHMEDNAGAR DIVISION.															
<i>Imperial.</i>															
Irrigation Works	12,589	1,875	...	11,578	4,341	37.6	7,478	11,886	158.9	9,130	14,570	203.4	9,570	13,832	139.2
Military Works	70,218	16,277	23.2	50,243	11,621	23.1	21,740	5,055	23.3	25,400	6,100	23.1	32,740	7,580	23.1
Barrack Department	8,263	827	10.0	7,171	640	8.9	5,604	57	0.4	6,000	600	10.0	6,030	600	9.9
Civil Works	163	39	23.0	80	20	22.5	1,305	300	23.0	110	20	18.2	150	30	20.0
TOTAL IMPERIAL	91,242	15,298	16.7	69,041	16,622	24.1	36,139	17,778	49.1	41,640	26,290	60.7	48,480	21,510	44.4
Provincial (Civil Works)	1,14,381	33,102	2.7	1,15,625	33,537	23.8	70,136	25,446	23.0	50,120	21,080	23.1	77,910	24,430	23.0
Local (do.)	66,832	7,971	...	65,973	7,923	...	71,304	8,588	...	63,980	7,680	...	68,810	7,060	...
Contributions	22	160	631.8	41	6	11.4	1,186	16	1.0	130	20	15.4	...	...	...
GRAND TOTAL	2,72,477	56,491	20.7	2,50,026	58,097	23.1	1,85,198	51,787	28.0	1,61,870	53,070	32.8	1,83,210	53,000	28.8
NASIK DIVISION.															
<i>Imperial.</i>															
Irrigation Works	21,622	31,978	147.9	8,269	15,336	185.5	9,307	7,972	85.7	9,710	18,160	186.9	14,100	21,610	153.5
Military Works . . . . .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Civil Works . . . . .	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL IMPERIAL	22,182	32,107	147.7	9,521	15,626	164.1	9,916	8,108	81.8	10,520	18,340	174.8	14,960	21,810	146.9
Provincial (Civil Works)	50,708	3,728	...	89,416	24,018	23.4	1,09,822	20,191	22.9	64,210	20,760	23.0	65,860	9,200	23.0
Local do	28,279	3,402	...	34,140	4,282	...	37,716	4,578	...	51,320	5,520	...	43,910	5,270	...
Contributions	894	25	2.8	1,016	6	...	11,674	363	3.1	2,850	280	9.8	...	...	...
GRAND TOTAL	1,02,060	33,262	33.5	1,31,293	43,910	33.4	1,69,127	42,240	25.0	1,31,900	45,900	34.8	1,24,320	47,000	37.8

Note.—The percentages against Irrigation works will be considerably larger when the charges on account of Direction and Accounts are added to the Executive establishment.

(3) *Letter from the Secretary to the Government of Bombay, Public Works Department, to the Secretary to the Government of India, Public Works Department, No. 327 A.—1282, dated the 14th August 1894.*

In reply to your letter No. 145—A.G., dated 8th September 1893, and subsequent reminder, I am directed by His Excellency the Governor in Council to state that the subject of provincializing the Nasik and Ahmednagar districts, which are at present classed as Imperial, has received very careful consideration at the hands of this Government.

2. The arrangement approved by the Government of India in 1889 included the proposal to classify, as below, the offices which, on the reduction of certain Irrigation

offices, were for the future to carry on the mixed duties, viz.—

Imperial	Chief or Superintending Engineer, Central Division.
	Nasik.
	Ahmednagar.
Provincial	The Gujarat districts.
	Satara.
	Sholapur.

The other offices remained either purely Imperial Irrigation or purely Provincial. Thus, in three offices, the Irrigation duties were combined with Provincial, and in other three Provincial duties were added to the Irrigation.

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3. I am to remark that, although the question before this Government is the provincialization of the Nāsik and Ahmednagar districts only, His Excellency the Governor in Council is of opinion that a complete solution of the matter requires that the office of Chief (or Superintending) Engineer, Central Division, should be included with these; for, were the two districts named to be made Provincial, the office of Chief Engineer, Central Division, would alone among the mixed offices, remain Imperial, and the nature of the then charge would offer no grounds for such a classification to continue. Whereas, at present, the Central Division consists of four Imperial and three Provincial

*Imperial.	Provincial.
Poona Irrigation.	Poona District.
Khandesh Irrigation.	Khandesh District.
Nāsik.	Sholapur District.
Ahmednagar.	

†Imperial.	Provincial.
Poona Irrigation.	Nāsik.
Khandesh Irrigation.	Ahmednagar.
	Poona.
	Khandesh.
	Sholapur.

districts; * it would, were Nāsik and Ahmednagar provincialized, comprise but two Imperial to five Provincial districts,† and it follows, in the opinion of His Excellency the Governor in Council, that, if the classification of the

two districts be changed from Imperial to Provincial, that of the office of Chief Engineer, Central Division, must be changed also.

4. With a view to this, the three offices have been considered together, and the possibility of a further reference hereafter, concerning an anomalous Imperial office, will thus be avoided.

5. I am now to invite reference to the correspondence that took place in 1887-89 regarding the reductions in establishment in this Presidency, and a brief recapitulation of the measures taken and the results obtained will not be out of place.

6. In response to a demand for reductions in establishment, it was decided to abolish certain Irrigation offices which, at large cost, controlled but little expenditure, and the works in charge of which produced but an insignificant revenue, and to amalgamate the duties then performed by these offices with those of the general branch offices of the districts concerned. In this way the offices of Chief Engineer for Irrigation, and Executive Engineers for Irrigation, Nāsik and Ahmednagar, Sholapur and Bijapur, Gujarat and Satara were abolished and the duties taken over, respectively, by the Superintending Engineer, Central Division, and the Executive Engineers of Nāsik, Ahmednagar, the Gujrat districts, Sholapur, and Satara—all Provincial offices—a saving being thus secured which, on the basis of the figures for 1887-88, was estimated to total some Rs. 96,000 per annum.

7. Had changes ceased there, it was estimated that this large saving effected in the Bombay establishments would have been almost entirely to the advantage of Imperial Funds, it having been estimated that about Rs. 1,000 annually only would be saved to Provincial, the balance of Rs. 95,000 going to Imperial. This was considered to be an inequitable distribution, and to give to Provincial an adequate share of the savings arising from economies effected in its own establishment; and the suggestion thus arose, which was accepted by the Government of India in 1889, to imperialise three of the six offices performing the mixed duties, and the three offices so imperialised were the Chief or Superintending Engineer, Central Division, and the Nāsik and Ahmednagar districts. The result of this on the basis of the same figures, was, as then calculated, to

apportion the saving of Rs. 96,000 between Imperial and Provincial in the proportion of about Rs. 84,500 to about Rs. 11,500. Imperial still getting the very much larger share, while in addition there was also a probability of future modifications adverse to Provincial, owing to reductions in Capital expenditure. It must be assumed that the Government of India recognised the effect of the accepted classification, and acknowledged that Provincial was entitled to the share of the savings effected which this ensured.

8. This Government is now asked to consider why the offices then made Imperial should not be provincialized, in view of the fact that the result of the existing system is that Imperial Irrigation is charged with abnormally high percentages for establishment—an anomalous condition of things in districts in which expenditure on Provincial and Local largely predominates.

9. His Excellency the Governor in Council, I am to remark, fully recognises the anomalies, and for other reasons beyond their removal would be glad to see these officers classified as Provincial; but he is of opinion that in approaching the subject, the reasons which led to the adoption of the present classification should not be lost sight of, and that the principle of leaving to Provincial a fair share in the economies effected by the amalgamation of offices should be maintained.

10. I am directed to append to this letter a statement prepared by the Examiner of Public Works Accounts, exhibiting the distribution of establishment charges between Imperial and Provincial of the three offices in question, according as they are classed as Imperial or Provincial, for the five years ending 1893-94, from which it will be seen that, had the Provincial classification existed, there would have been an annual average loss to Provincial (and a corresponding gain to Imperial) of Rs. 29,572 during that period.

11. It will be evident from this that, had the Provincial classification existed, not only would Provincial Funds have received no benefit whatever from the economies effected in 1887-88, but they would have been put to a clear loss of some Rs. 18,500 annually, while Imperial, instead of saving Rs. 85,000 would have profited to the extent of some Rs. 1,14,500, of which Rs. 18,500 would have been actually at the expense of Provincial Funds.

12. His Excellency the Governor in Council trusts that under these circumstances, the Government of India will recognise the right of this Government to look for compensation in the shape of an adequate addition to the Provincial grant, or to an addition to the rate of 23 per cent. now received for Imperial expenditure, if these offices are provincialized, and I am directed to suggest, for the consideration of the Government of India, that an additional annual grant of Rs. 30,000 to Provincial, to enable this Government to meet the additional charges, would be an equitable re-adjustment, unless the Government of India would prefer to give compensation by a special re-adjustment of the percentage rates. If the terms of the re-adjustment can be satisfactorily settled, immediate steps will be taken to provincialize these offices from the 1st April next.

13. I am to submit that, should the Government of India not be prepared to grant the compensation suggested, this Government would be, it considers, inequitably treated in being called on to sacrifice the small advantage to Provincial, which, owing to the Imperial classification of these offices, accrued from the economies effected in 1887-88, and to further burden Provincial Funds with considerable additional charges for Establishment.

Statement of distribution of Establishment charges showing the effect on Provincial Funds during the five years ending 1893-94 if the classification of the offices of Chief Engineer, Central Division and Executive Engineers, Nagar and Nāsik Districts, were altered from Imperial to Provincial.

Offices.	1889-90.		1890-91.		1891-92.		1892-93.		1893-94.		AVERAGE PER YEAR	
	Imperial.	Provincial, Local, etc.	Imperial.	Provincial, Local, etc.	Imperial.	Provincial, Local, etc.	Imperial.	Provincial, Local, etc.	Imperial.	Provincial, Local, etc.	Imperial.	Provincial, Local, etc.
<i>Distribution as per existing Imperial Classification.</i>	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Chief Engineer, Central Division .	25,476	30,066	28,044	10,480	25,885	19,147	23,004	16,129	15,870	22,000	24,576	20,764
Executive Engineer, Ahmednagar District .	15,268	41,223	16,022	41,465	17,778	34,009	18,412	27,342	14,902	33,038	16,614	36,415
Executive Engineer, Nāsik District .	32,107	7,155	15,626	28,203	8,108	34,132	10,302	25,898	9,075	37,825	16,814	26,078
TOTAL .	72,851	78,444	60,292	80,238	51,671	87,288	51,718	69,369	39,707	97,903	58,004	83,857
<i>Distribution as per proposed Provincial Classification.</i>												
Chief Engineer, Central Division .	11,346	44,196	9,683	34,841	7,098	37,734	7,961	36,172	11,215	28,456	9,460	35,579
Executive Engineer, Ahmednagar District .	24,533	31,058	17,555	40,832	10,129	41,658	8,643	37,141	14,274	33,726	15,027	33,003
Executive Engineer, Nāsik District .	4,007	35,355	3,777	10,142	4,065	33,175	3,258	41,002	4,740	42,280	3,975	39,547
TOTAL .	39,886	1,11,409	31,015	1,15,616	21,292	1,17,567	19,862	1,14,315	30,229	1,07,441	28,462	1,14,129
Difference due to change .	-32,965	32,965	-24,277	24,277	-30,278	30,278	-45,755	45,755	-9,478	9,478	-29,572	29,572

(4) *Letter from the Deputy Secretary to the Government of India, Public Works Department, to the Secretary to the Government of Bombay, Public Works Department, No. 137-A.G., dated the 12th September 1891.*

With reference to your letter No. 327A.—1289 of the 14th August 1894, on the subject of the provincialization of the Nasik and Ahmednagar districts, I am directed to request that you will furnish the Government of India with a statement in the accompanying form showing the total cost of the Public Works Department establishment in Bombay proper (excluding Sind) for the five years ending 1893-94 re-distributed in accordance with the following principles:—

- (a) The whole of the Public Works Department establishment of Bombay proper to be treated as Provincial and the cost of that establishment divided between Imperial, Provincial and Local Funds in proportion to the outlay incurred on works and repairs from each of those Funds, after deducting the share chargeable to the Barrack Department at 10 per cent. and to the Buildings and Roads and Irrigation Branches on account of revenue collected at 5 and 10 per cent. respectively.
- (b) If there be a separate Revenue establishment on account of Irrigation works, the whole cost of that establishment to be charged to Irrigation instead of the 10 per cent on Revenue.
- (c) The charge to the Barrack Department to be calculated in accordance with Public Works Department Code, Volume II, Chapter IV, paragraph 147, clause iii.

2. The total charge for establishment to each fund will thus be made up of the share calculated at the proportionate rate mentioned in paragraph 1, clause (a), plus the revenue collection charges.

(5) *Letter from the Secretary to the Government of Bombay to the Secretary to the Government of India, Public Works Department, No. 513-A-1925, dated 19th December 1894.*

With reference to your letter No. 137-A. G., dated 12th September 1894, I am directed to forward herewith a statement, prepared by the Examiner of Public Works Accounts, furnishing the information required by the Government of India.

2. I am at the same time to point out that this Government do not admit that a proportion founded on the total Public Works Department expenditure of the Presidency (excluding Sind) is a fair measure to apply to one particular class of works included in that total, and His Excellency the Governor in Council considers that any such valuation, which omits the special circumstances of the class of works concerned and the extent and cost of the supervision necessary for them, is likely to prove misleading.

3. There are now in this Presidency three separate districts maintained specially for irrigation, which cost about Rs. 1,40,000 per annum, and these (Poona, Khandesh and Dharwar) must, for the present at all events, continue to be kept up for the purpose. With a sufficient amount of capital expenditure, the general rate for the whole Public Works Department (excluding Sind) would meet the cost of these establishments, but there are now practically no capital works, and the expenditure is chiefly for maintenance of scattered works, which is necessarily more costly than the average rate for the Presidency, in which both original works and repairs are included.

4. I am to again ask the Government of India to bear in mind the large saving to the Imperial Exchequer, which resulted from the reduction of one Chief Engineer's office and four Executive Irrigation districts in 1887-88. I am to remark that this reduction was effected without cost to Imperial, for the reduction in the number of appointments was not combined with a reduction in the strength of establishment by the transfer to the Government of India of the proportionate number of officers, as was done when the Military Works were separated from Provincial, though that this was originally contemplated, is evidenced by paragraph 18 of this Government letter (*Confidential*), No. R., dated 20th May 1887. Had the Government of India taken over the surplus Irrigation Officers comprising one Chief Engineer, four Executive and four Assistant Engineers or granted special pensions to retire some or all of the officers concerned, the saving effected to Imperial would have been very largely reduced, but, instead of this, Provincial arranged for the employment of these officers, and this increased the saving to Imperial Funds. It is true that the changes made were accompanied by a re-organization of the Department, but this, without immediately reducing the total strength, reduced the number of the higher appointments.

5. I am to say the large benefit derived to the Imperial Exchequer, however obtained, must, in the opinion of His Excellency the Governor in Council, be considered an important factor in the matter now under consideration and it is to emphasize the moral claim to the compensation asked for that the facts have been now again put forward.

Statement showing a re-distribution of the Establishment Charges in the Bombay Presidency (excluding Sind) for the five years ending 1893-94, calculated in proportion to the outlay on Works and Repairs prepared agreeably to the instructions contained in the Government of India, Public Works Department, No. 137 A. G., dated 12th September 1894.

FUND HEADS, ETC.	1889-90.		1890-91.		1891-92.		1892-93.		1893-94.		AVERAGE.	
	TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.			
	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Imperial Irrigation Works.	1,79,824	2,48,430	1,57,857	2,44,272	1,26,500	2,26,401	1,54,425	2,47,424	2,09,586	2,72,744	1,65,698	2,45,657
Imperial Military Works.	2,13,431	1,79,726	43,338	35,417	45,727	39,912	40,741	29,947	46,542	32,830	79,634	63,552
Imperial Civil Works	23,713	19,663	33,502	27,565	37,014	30,193	34,693	27,178	61,079	42,726	39,180	29,465
Imperial Barrack Department.	11	5,879	18	1,166	9	1,063	21	1,173	13	1,099	15	2,075
Provincial . .	6,98,353	8,64,940	7,50,054	9,08,271	6,86,690	8,46,240	6,41,918	8,55,461	6,32,370	9,70,273	6,53,678	8,60,036
Incorporated Local .	2,11,937	87,697	2,30,493	1,03,023	2,61,876	1, 3,436	3,22,839	1,30,445	3,26,557	1,21,377	2,71,399	1,13,415
Contributions, etc. .	1,03,282	24,263	1,33,600	33,873	1,50,631	41,191	1,42,034	45,183	94,345	30,435	1,24,779	35,584
TOTAL .	14,30,601	14,30,601	13,58,222	13,58,222	13,11,446	13,11,446	13,36,662	13,36,662	13,72,003	13,72,003	13,01,787	13,01,787

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(6) Letter from the Secretary to the Government of Bombay, No. 163 A.—538, dated 21st March 1895, to the Secretary to the Government of India, Public Works Department.

With reference to your telegrams Nos. 14 A. G. and 20 A. G., dated respectively the 18th February and 6th

Statement showing a re-distribution of the Establishment Charges in the Bombay Presidency (excluding Sind) for the three years ending 1885-89, calculated in proportion to the outlay on Works and Repairs, prepared agreeably to the instructions contained in the Government of India, Public Works Department, No. 137 A.-G., dated 12th September 1894.

FUND HEADS, ETC.	1886-87.		1887-88.		1888-89.		Average.	
	TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.		TOTAL ESTABLISHMENT CHARGES.			
	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.	Charges calculated at a proportionate rate.	Actual charges under existing rules.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Imperial Irrigation Works	1,55,707	3,61,458	2,15,863	2,83,562	2,14,500	2,53,053	2,04,624	3,00,358
„ Military Works	1,94,259	1,83,769	1,61,401	1,39,683	1,87,612	1,60,286	1,82,421	1,61,216
„ Special Defence Works	28,354	26,150	43,540	37,636	1,27,639	1,08,626	66,491	57,448
„ Civil Works	37,527	34,710	60,495	53,57	24,952	21,957	40,992	36,861
„ Barrack Department	33	6,161	17	5,74	20	5,812	23	5,783
Provincial	8,73,726	8,65,818	7,68,316	8,68,763	6,83,722	8,49,023	7,71,931	8,01,201
Incorporated Local	2,02,904	1,01,270	1,90,159	80,630	2,16,333	65,813	2,03,142	91,404
Contributions, etc	57,664	11,755	56,665	10,551	50,571	11,719	56,100	11,429
Total	15,94,121	15,94,124	14,86,316	14,86,356	15,05,749	15,05,749	15,28,730	15,28,750

Witness.—The question of Provincialisation of these two districts is largely a question for the Financial Department. When certain districts and appointments were abolished, there was a saving of Rs. 96,000,—Rs. 1,000 Provincial and Rs. 95,000 Imperial—and this Government claimed some share of the direct savings it had effected. It was proposed to retain the three Imperial Irrigation Districts which with Ahmednagar and Nāsik also Imperial, would balance matters. The Government of India, in replying, noted that this would be unfair to irrigation works in the latter districts and requested that an alteration might be made in the proposal. In 1895, the Bombay Government pointed out their reasons for the retention of the old arrangement, but said they were quite willing to alter it if compensation for the loss, viz., Rs. 30,000 annually, were granted. Further information was called for, but nothing further was done. This was in 1895.

(Oral evidence continued from page 264.)

9. Q. (The President).—There is doubt that the establishment charges are unfair to individual works of irrigation?—They are made according to the code rules. The average establishment charges in the Bombay Presidency for the 10 years ending 1901, on all works carried out was 27½ per cent., the lowest was 24·33 per cent. in 1877; the highest 29·6 per cent. in 1888-89, this being due to restriction of expenditure, while the cost on the Provincial works was 31·12 per cent. The reason of this undoubtedly is the large expenditure on irrigation works in Sind, which reduces the percentage considerably.

10. Q. What is the percentage charged to Provincial and Imperial Funds?—If the district is Imperial we charge 23 per cent. to Provincial funds, and the balance to Imperial, and *vice versa*. The result is that in such districts as Nāsik and Ahmednagar, which are Imperial, the Provincial funds are charged 23 per cent. and the Imperial a much larger percentage. The irrigation charge is dependent on the amount of Provincial Works carried out during the year.

11. Q. (Mr. Higham).—A good deal of the expenditure comes from local funds?—Yes; we charge local funds only 12 per cent. and the Provincial Government meet the difference between 23 per cent. and 12 per cent.

12. Q. You say that the Government of Bombay asked to be compensated if the scheme for provincialising the establishments was carried out?—Yes, but we received no answer.

March 1895, I am directed to forward herewith the statement, prepared by the Examiner of Public Works Accounts showing a re-distribution of the establishment charges in the Bombay Presidency (excluding Sind) from 1886-87 to 1888-89.

The reason for which the Bombay Government wished to retain the two districts mentioned as Imperial or get compensation was that they wished to keep their share of the reductions made by the re-organisation of 1887. We asked for an additional grant of Rs. 30,000, or an addition to the rate of 23 per cent. on establishment charges for works carried out from Imperial funds.

13. Q. It was suggested that the average was 26 per cent.?—Yes, there would be no difficulty if this were given. We have had no further correspondence on the subject since 1895. In 1896 the Government of India proposed to provincialise the whole of the expenditure in the Presidency; they asked the Finance Department for their opinion, and later on a reply was received that they had no intention of provincialising irrigation in the Deccan and Gujarat.

14. Q. (Mr. Ibbetson).—If allowance is made for revenue, the actual expenditure would work out to about 23 per cent.?—Probably 23 per cent. might be fair. I am not prepared to say exactly what, but I do think some allowance should be made.

Mr. Muir-Mackenzie to Mr. Higham.—The Government of India suggested in 1896 that the whole of the expenditure on irrigation should be provincialised. This was practically a reply to the Government of Bombay's letter of 1895.

15. Q. (Mr. Higham).—We have been told by some witnesses that a distinction has been made between works called respectively "Protective" and "Productive." We are told that the works which are called "Protective" cannot be worked on commercial principles, so as to secure a maximum revenue, because the water must be preserved for years of drought. Are there any orders on this subject from the Government of India?—I cannot point to any orders, but there is no doubt that we do make a distinction. There are orders, I think, but whether from the Government of India or the Bombay Government, I cannot say. On "Productive" works you make as much as you can. On "Protective" works you reserve the water for food crops.

16. Q. I do not see what authority you have for the distinction?—I cannot point to any order, but it is the general practice. On the Nira canal sugar-cane is restricted because it is a "Protective" work.

17. Q. We have heard of various irrigation projects; what is the present state of the Maladevi and Chankapur tanks?—The Maladevi project has come up to the Bombay Government in a complete state. It has gone back to the Superintending Engineer for revision and for report on certain points.

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18. Q. Do you propose to recommend the project for sanction?—When we get the information, if the results are satisfactory, we will recommend it. The project has already been reported on by the Revenue officers very satisfactorily at various stages. Mr. Muir-Mackenzie himself reported on it at great length.

19. Q. I believe the Local Government are still doubtful, as to whether it should be a protective or productive work, do you know whether they have made up their minds?—So far as the Public Works Department is concerned, we shall recommend it as a protective not a productive work.

20. Q. What about Chankapur?—It has gone back to the Superintending Engineer for revision; it is with him at present. The plans and estimates were submitted 2 or 3 years ago, but the Government of India asked for certain further information.

21. Q. Has the question of the canals proposed in connection with the Tapti and Sabarmati been before the Government in any definite form?—Not lately, the papers are before us.

22. Q. They are old proposals revised again. Are they in any definite form before the Government?—Government have called for the papers, and a report on the projects was submitted some time ago, but they have not yet decided what should be done.

23. Q. The Gokak Canal, you say is the only Provincial Canal in the Bombay Presidency?—Yes, but we do not consider it as constructed for irrigation purposes. A lease was granted to a Company many years ago by Government for the supply of water to the Gokak Mills. Government has undertaken to supply their requirements.

24. Q. But the Mills do not pay very well for the water?—That is so, but we are bound to supply it.

25. Q. A good deal of the water in the Gokak River goes to waste, could not some of this water be used for irrigation?—There is great waste in the monsoon, but the reservoir ran dry last year in the hot weather for some weeks, and we were unable to supply water to the Company and were liable to claims for compensation, but they did not press the matter.

26. Q. I think Mr. Beale has a project for considerable extensions of this work, which we are going to see?—Yes, Mr. Beale has three alternative schemes, the estimates of which are over 91 lakhs.

27. Q. Do you know anything of these schemes?—No; they have not been before the Government in any time. They have been made out by Mr. Beale from information and inquiries he made locally. I know of the proposal to raise the weir, but it has not yet been finally considered.

28. Q. Were there any proposals sent up to you for completing tanks or other irrigation works, which had been undertaken for famine relief?—We have been urged to complete two works, one in Sholapur and the other in Nasik. The Sholapur work will cost Rs. 1,22,000. The present consideration is, what to charge it to. It will be partly for irrigation and partly for the water-supply of the Barsi Municipality. At present, I see no justification for completing the tank as an irrigation work. We have asked for further reports on these two.

29. Q. Have you any other works in other districts that it is desirable to complete?—For the present, we are asking for one lakh of rupees in a lump-sum to be expended on such works, as it is considered desirable to complete. When we have decided which should be completed, we will apply for more.

30. Q. (Mr. Ibbetson).—I understand that the whole of the water-rate is credited to Imperial Funds?—Yes, with a deduction for collection.

31. Q. What proportion of the Land revenue?—Three-fourths. I think it is three-fourths of the consolidated rate.

32. Q. You have two ways of realizing revenue, one is a water-rate, and the other a land rate. Is local cess charged on the water-rate?—No.

33. Q. On the consolidated rate?—I cannot tell. If the cess is not realized by the Provincial Government on the water-rate, it is to their interest to charge the consolidated rate.

34. Q. (Mr. Rajaratna Mitr).—Local cess is not charged on the Nira Canal?—Yes.

35. Q. (Mr. Ibbetson).—We have been told that the proportion of the total land revenue credited to water should be higher than it is?—I have no intimate knowledge on the subject except as regards Sind. I do not know as regards the Deccan.

36. Q. You have just told us about the system of debit which obscures facts as regards individual works. On a large number of new tank works, the working expenses are shown as Rs. 3 an acre all round; but, if the actual working expenses were taken, the charge would amount to Rs. 1 or Rs. 1-8-0?—No, the difference would not be so great. Only in some districts is the charge abnormal, Rs. 3 or Rs. 2-8 is more likely the figure.

37. Q. It is almost an accepted fact that establishment should be charged to tanks and protective works so as to relieve roads and buildings. Do you know of the existence of any orders to that effect?—The orders are that in a District 23 per cent. is charged to Provincial and the balance Imperial to Imperial and *vice versa*. It is not possible for the Executive Engineer to make any difference; he has no power in the matter. It lies with the Examiner of Accounts, who makes the proper apportionment.

38. Q. You say all irrigation in the Presidency is Imperial, except the Gokak works; do you include the small tanks?—Yes, the expenditure on them is Imperial.

39. Q. You say that the question of provincialization of irrigation is mainly one for the Finance Department to consider; would not the fact that the Provincial Government had a direct pecuniary interest in extending the efficiency of irrigation works ensure more attention being paid to the works?—I do not think any more attention would be possible than is given now, whether the works were Provincial or Imperial. Our hands are tied by the unprofitable nature of the works. At present they are maintained at a loss. There is no difficulty in getting money that can be usefully spent.

40. Q. Is that the case as regards Minor works?—There is not much difference as regards grants for Major or Minor works. We certainly have no difficulty in regard to productive works.

41. Q. We have heard a good deal of talk about the failure of Government to fulfil its responsibility of clearing out the Gujarat rice tanks: if you had asked for money, would you have got it?—It was not a case of want of money. We never asked for large sums: we could have got more money.

42. Q. (The President).—We were told that you never spent the money you had at your disposal?—There certainly were difficulties in the way which I think were mainly due to the orders that preference should be given to those cultivators who made a 10 per cent. contribution towards the repairs of their tanks. There was no difficulty about spending the money. In some places tanks were not taken up till the cultivators said they would pay contribution and petitions were sent in. The works for those willing to pay the 10 per cent. were scattered over a big area. It would be easy enough to take up the tanks in one locality and finish them off, but it is difficult when precedence has to be given to scattered tanks willing to pay 10 per cent. It is not a fact that the delay in the budget sanction was any difficulty. When I was Superintending Engineer, Northern Division, I knew the sanction would come and I gave instructions that money would be available and that they might assume accordingly. Some such order was made to the Executive Engineer, and I informed him of what the proposed allotment was.

43. Q. (Mr. Ibbetson).—Is the 10 per cent. rule a good one? Is it worth keeping up?—I think it ought to be done away with, and the rates increased to compensate Government, if necessary.

44. Q. With regard to the Chankapur Tank, the interest charges are almost as much as the Capital outlay, the figures being Rs. 60,000 cost and Rs. 49,000 interest, can you tell us the cause?—I cannot tell at this moment. It was sanctioned and under consideration before I became Chief Engineer.

45. Q. We have been told by the Executive Engineer for Irrigation, Poona, that he has no knowledge of the financial results of his work, largely on account of the artificial establishment charges?—I have always considered that an Executive Engineer should judge the result of his work by the number of acres irrigated: the more irrigated the better.

46. Q. Is credit given to the Executive Engineers who obtain the best results?—The Executive Engineers are given credit for it in the reports.

47. Q. Supposing one man has a small area of high paying crops, and the other a greater area but low paying crops, the area would not be the correct measure?—No.

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48. Q. Do you think it would be feasible to reconstruct the Irrigation Department in the Bombay Presidency?—I certainly think that in Bombay we should have a Chief Engineer entirely for irrigation, one man cannot properly look after the whole Presidency.

49. Q. From the lessons of the past five or six years, do you think there should be some separation?—I think some relief should be given to the present staff. If the department is entirely separated, the cost would be enormous. Temporary separation may be made, while works are being carried out; but I do not think that the existing irrigation works are sufficient in number to justify entirely separate Executive establishments.

50. Q. Have famine programmes been prepared for all districts liable to famine?—We have been living from hand to mouth on existing programmes; but we have made new programmes as far as possible.

51. Q. Are there any districts in which famine has not occurred, but for which programmes were prepared?—Yes, the Konkan. In the Konkan there has been no famine for the past five years.

52. Q. Have the Konkan programmes been revised lately?—Yes, at the beginning of the last famine. I think they are revised every six months.

53. Q. Is the Forest Department consulted as to whether they could suggest famine works?—Yes, certain forest works are included in all the programmes.

54. Q. There are large forests and aboriginal tribes in the K kan?—Yes, but they were not affected by the distress.

55. Q. How are the repairs of the small tanks in Gujarat carried out; are they repaired?—We do repair them from time to time, when the Executive Engineer has decided which of them are to be repaired. He is ordered to review them every five years or so, and report on their state.

56. Q. Mr. Lawrence told us that there was a proposal to legislate in order to compel the people to keep these tanks in repair?

Mr. Muir-Mackenzie:—That proposal has been abandoned for the present.

57. Q. (Mr. Rajaratna Mdlr.)—You refer to the subject of making the Irrigation Department separate, how many Superintending Engineers have you got now?—Five, excluding special men.

58. Q. Considering the small number of men on Irrigation works, would it be possible to reduce the number and put some on irrigation projects?—I don't think so, as the Engineers in some instances have local works as well as irrigation to superintend.

59. Q. I want to know if you can make three Divisions and spare two officers?—No, it is quite impossible. We have two officers in Sind where we had formerly only one. And they have quite as much as they can do and more.

60. Q. As regards tank works, you said you had no difficulty in obtaining money for repairs. We find that very little money has been spent in the last 25 years in repairing these minor tanks in Gujarat. Why, as the money was available, was so little spent on their repair?—I don't mean that we could get an unlimited amount of money. We got what we want, but we have difficulties in spending it.

61. Q. In Mr. Beale's report, the working expenses as given are said to be fictitious?—They represent a share of the actual establishment of the district calculated on the 23 per cent. basis for provincial works.

62. Q. How does it compare with the actual expenditure?—There is no way of finding out. The Examiner takes the total expenditure of a district. If it is an Imperial district, he debits 23 per cent. to Provincial, and debits the rest of the expenditure to Imperial.

63. Q. Is there no record of the actual expenditure on irrigation?—No.

64. Q. (Mr. Muir-Mackenzie.)—It is a generally accepted axiom that protective works should be managed by reserving a certain percentage of the water for food crops?—Yes, but I have no special orders that I can point to.

65. Q. The particulars of such works have been submitted to the Government of India?—Yes, the Nira project was prepared with the intention of its being managed as a protective work. There was a tacit understanding with the Government of India that the Nira Canal would be worked as a protective work.

Mr. Higham.—You cannot produce any Government Resolution in which these orders were contained, and I am sure that no such restrictions were intended or conveyed by the Government of India.

Mr. Muir-Mackenzie.—I do not wish to argue the point, but that is the feeling on the subject.

The President.—If the Bombay Government think that they are tied down to that view, I would suggest that they should communicate at once with the Government of India.

66. Q. (Mr. Muir-Mackenzie.)—In regard to the Mula-devi tank, how long have the plans been with the Superintending Engineer?—Not very long. We kept them back a little as a matter of fact, as I wanted to lay them before the Commission, which we thought was coming here earlier. We found that the figures had not been signed by the Superintending Engineer, and some information was wanting and so they were sent back to him.

67. Q. (The President.)—You may be sure that, if it has a good reservoir, the scheme will be backed up by this Commission?—It is a good scheme; the only question is, whether it will pay.

68. Q. (Mr. Muir-Mackenzie.)—As regards the completion of work begun in the Famine, should not all the works be completed which would pay interest and working expenses on the cost of work necessary for completion?—You have to put in the famine labour.

69. Q. Leaving out the famine labour, would they pay interest and the working expenses?—I can see no objection to that except, that it will leave no work for a future famine. If they would pay interest on the further capital expended, I think it will be a wise plan to complete them. But having regard to their protective value, I do not think it would pay to complete them, if they only pay their working expenses.

70. Q. If any irrigation work does good to the villages close to it, there can be no doubt that the villages under its influence are better prepared to resist famine. It has a protective effect upon the villages. We have to consider that protective effect; it is not a question of money, i.e., whether it would pay or not?—It is difficult to estimate the protective value of works. In selecting works, we expect that they will at least pay their working expenses; but I doubt if the protection is worth the money in many cases.

71. Q. With all the experience you have had with regard to famine labour, do you think there is any better way of employing it than on tanks and canals?—I think metal breaking is decidedly inferior. Tanks, whether they pay or not, are better. The metal broken may not be of any use: the tanks always will be of some.

72. Q. Do you see very much scope for road-making with famine labour?—No doubt, many roads could be made, but where is the maintenance to come from.

73. Q. Many of the roads were made in old times before the railways were built; could not new roads be made to feed the railways, and the old ones be abandoned?—That is a point I have not considered.

74. Q. You said to Mr. Ibbetson that we had been living from hand to mouth with regard to famine programmes, would it be worthwhile, even at considerable expenditures to have programmes of tank works prepared with full plan, and estimates sanctioned, so that, if a future famine came upon us, the work could at once be undertaken with famine labour?—I think special arrangements will be necessary to prepare programmes for future famines. Before the last famine, the Public Works Department was just recovering from the effects of their work in connection with the famine of 1896. Various proposals were made. It was proposed that an Executive Engineer should be put on special duty to complete projected works, but before anything could be done, the last famine came upon us, and we had no time to do it. I consider it very necessary that we should, in future, have a special establishment to prepare famine programmes. Without this, I do not see how it is to be done.

75. Q. Do you think that irrigation works require special consideration?—I consider it a class of work to which preference should be given.

76. Q. You think the programmes when made should be carefully examined?—Yes, it is very important; but the question of cost has to be considered. At present the cost of surveys is debited to ordinary funds, and not to famine relief.

77. Q. You have at present an Engineer carrying out special surveys. His services will have to be charged to

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irrigation, but you will have to get a special grant before you can do that?—I cannot charge his services against 33, all his expenditure is charged to 35.

78. Q. (Mr. Thelston).—Has not the Secretary of State ordered such surveys to be charged against famine (No. 35)?—No such orders have as yet been received by me, but I have heard that there is such an intention.

79. Q. (Mr. Muir-Mackenzie).—There are other charges too, for which we have to go to the Government of India?—At present a list is being prepared which shows that 3 or 4 lakhs are required for land compensation charges, partly for irrigation and partly for roads and railways. The Local Boards have no funds to meet their share.

80. Q. It was suggested by one of the papers that there was unnecessary delay in taking up land. When you have definitely decided on a certain site for a famine project,

why not take it up at once and re-let it to the late owner, so that there should be no delay in starting the work when necessary?—I have not heard of any delay, if there was any we could meet it. There could only be 15 days' delay, as notice under the emergency clause of the Land Acquisition Act empowers us to take it up at once.

81. Q. One of the witnesses suggested that the land should be taken up at once as it might go up in value. What do you think of terracing the country with *thals*?—I suppose you mean Mr. Joynors' proposal. Yes, it was considered; but it was thought that for large works under the Public Works Department, it was undesirable, as the labour on it would be difficult to control, and there were other difficulties which prevented the Public Works Department from taking it up. It would be good work, if you could get over the proprietary rights of the people.

WITNESS NO. 62.—MR. K. R. GODBOLE, Executive Engineer, Public Works Department.

Answers to printed questions.

I am now on long leave, and cannot therefore make any official and local enquiries and obtain the requisite detailed information for answering the questions proposed by the Indian Irrigation Commission. I have also no files, returns, reports, or statistics to refer to, and will therefore give below such general information about irrigation in Sholapur district as I think likely to be useful. My evidence will relate mainly to the Sholapur district, where I was working as Executive Engineer in charge of the district for 6½ years before I availed myself of my present leave. Detailed information regarding rainfall, present and proposed works, irrigation distribution and control, crops, waterings, out-turn, cost, etc., will be forthcoming from the written and oral evidence of the present Executive Engineer of the Sholapur district.

2. The Sholapur district is situated in the dry zone of the East Decan, and is one of the first districts in the Bombay Presidency to be affected by famines and seasons of scarcity. Its rainfall is precarious and uncertain. Very often it fails at end of the kharif and rabi seasons. Such failures tend to the partial or total failures of crops, and bring on seasons of famine and distress.

3. The cultivable soil of the district is mostly poor, being a top-layer of brown or black clay overlying muram and rock below. The top-layer of brown or black soil varies from 3 inches to 2 feet in depth. On the banks and in the valleys of nallas and rivers the soil is rich black, but the extent of such land is not considerable.

4. The district is traversed by the Great Indian Peninsula Railway, and there will be soon another narrow gauge line between Pandharpur and Nizam's Frontier *via* Barsi Town. There are good means of intercommunication by roads also. There is no immediate necessity of further road communication in the district.

5. The only means that remain to be taken up now for protecting the district against famines and seasons of scarcity consist of the development of irrigation works. These should be extended as far as practicable. There are two rivers in the district, namely, the Bhima and the Seena. But they are not favourable for canal irrigation, as the water-supply in both is not perennial. The river banks are also much broken up by high muram ridges which approach almost to the river edge at short distances apart. Such conditions are not favourable for pick-up weirs with canals starting from the same.

6. It may perhaps be practicable, however, to construct a weir on the Nira river below its confluence with the Kara river, and take a left bank canal from the same for irrigating the Malsiras taluka of the Sholapur district. The canal will pick up the waste water of Nira Canal after it has done its duty. The discharge of the Nira river at the site of the proposed weir will probably be considerable, even in the hot weather, on account of the construction of the Bhatghar Reservoir and the perennial irrigation on the Nira Canal. I throw out this suggestion for further consideration, and for development of the project, if the same be found to be feasible.

7. In the absence of perennial rivers in the Sholapur district, the only classes of irrigation works practicable are irrigation tanks and wells. Four irrigation tanks have already been constructed in the district, all of which have been fairly successful. They have more than paid their working expenses, and have been the means of raising large

quantities of food stuffs and fodder in years of scarcity and famine. In ordinary years they have been the means of raising high class and paying crops. The growth of these crops has raised the status of almost all irrigators. All the irrigating villages under the tanks have thrived, and become almost independent of Government assistance in times of famines and distress.

8. I strongly advocate the construction of as many irrigation tanks as practicable in the Sholapur district. The only conditions for tank works undertaken by the State should be that the catchment area should be not less than 12 square miles, and that the tank when completed should at least pay its working expenses. Tanks with large catchments should be given preference first. But in the absence of sites with large catchments, I would accept smaller catchments rather than not construct the tanks. There is a considerable number of sites in district with catchments of 12 square miles and upwards.

9. In years of scarcity and insufficient rainfall the tank with smaller catchments will not fill, but the direct and indirect advantages derived from them in ordinary rainfall years will more than compensate for this drawback. Even in bad years the tank will hold some water which can be very profitably used in the saving of the ordinary kharif and rabi cultivation under command. It frequently happens in the Sholapur district that ordinary kharif and rabi crops thrive well in their initial and middle stages, but wither and are lost for want of one or two rainfalls in the end. Such crops, if under command of the irrigation tanks, I advocate, will be saved by giving one or two waterings for the tanks. The stored water required will be small, but the value of the crops saved will be very great.

10. I give below the several advantages that will be obtained by the construction of the irrigation tanks I refer to:—

- (a) In ordinary rainfall years all the tanks will fill and carry out the objects for which they have been designed. In very bad rainfall years the tanks with smaller catchments may not fill, but even in these years they will hold some water which can be most advantageously and profitably used in the saving of ordinary kharif and rabi crops under command by giving one or two waterings.
- (b) The tanks will be useful for water-supply for men and cattle. This is a great desideratum in a dry district like Sholapur.
- (c) They will raise the sub-soil water-level of the adjoining country. This raising will extend all round the tank margin and for 4 or 5 miles below the tank dam. This will be a great advantage for lift irrigation by means of wells.
- (d) Large and thriving plantations of babul wood and other fuel trees will spring up round the margins of the tanks. This will be a source of income to the State, and will increase the fuel supply of the district.
- (e) The protected villages under the tank will become independent of Government assistance in times of famine and distress. The condition of the irrigators will improve to such an

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extent that they will not resort to Government relief works, or ask for other help from the State in times of famine.

(f) The tanks will provide a considerable extent of grazing round their margins and on canals for cattle in the neighbourhood.

11. In tracts where irrigation tanks and canals are not practicable, the construction of wells should be freely encouraged. The wells should first be excavated to water-bearing strata and enlarged if successful. Government should not attempt constructing wells by their own agency in private lands. The construction should be left to the holders of the lands themselves, who very well know how and where to construct the wells. Government assistance should be confined to making "tagai" advances on as easy terms as practicable to the using of derricks and boring instruments, and to the undertaking of dynamite blasting when required. The using of boring apparatus and dynamite blasting can be carried out by Government or Local Board professional agency at the expense of the agriculturists concerned.

12. An irrigating well in the Sholapur district, capable of working one "mot," with a masonry platform for one "mot" only, can be constructed at an average expenditure of Rs. 300, and it will irrigate about 3 acres all the year round.

13. The only income obtained by Government at present from the irrigation works is from the sale of tank and canal produce and from the sale of the tank water. The lands under command have the great advantage of being protected by the irrigation work, that is in a season in which the rainfall is insufficient and untimely, the occupant has got the great convenience of taking canal water and of saving his crops. He pays for the water when he takes it, but for the potential advantage that his land enjoys on account of the construction of the Government irrigation work, he pays nothing. In revision settlements, the Settlement officers will probably enhance the land assessment on account of the irrigation facilities and protection herein referred to. If there is such an enhancement of revenue, due to the construction of the Government irrigation work, the work should, I think, get a book credit for it. This is a matter that is worth consideration during revision settlements.

14. The present system of assessing revenue charges on an irrigation work is, I think, faulty. The correct system would be to take the actual cost of repairs and maintenance, and to add a certain fixed percentage to it for establishment charges. The percentage should be 12, being the same as debited to Local Board works. Instead of such a procedure the revenue accounts of irrigation works are debited at present with very heavy establishment and book charges, and the result is that the works are shown as not paying, or as being worked with a loss. The rules on this subject should, I think, be re-considered.

15. The demand for water in deep black soil is generally much less than in the case of other soils, and in ordinary rainfall years the black soil fields require no assistance from irrigation works, so far as ordinary crops are concerned. In the Sholapur district, however, irrigation is sought after for all kinds of soils whether rich, black or light. In black soil plains it is required for the irrigation of sugarcane, fruit-trees and other valuable crops. The Sholapur people are anxious to obtain water for irrigation purposes everywhere. But in black soil areas it is not likely to be used to the same extent as in the case of the other soils. Preference should be given therefore to the command of lighter soils in selecting sites for irrigation tanks.

16. Small tanks constructed in black soil can hold water like other tanks in the district, if sufficiently deep puddle trenches are provided below the impounding dams. High dams cannot be made of pure black soil. There should be an admixture of muram or red or yellow earth with the black soil before it is put into the dam. If made of pure black soil, the dam materials will swell with rain and moisture, and the swelling will lead to cracks and slips. The earthen dams in the Bombay Presidency are made of mixtures of black soil and muram and covered with a casing of muram on all exposed faces. No masonry core walls are necessary for earthen dams, if adequate concrete and puddle trenches and drainage gutters are provided under the dams for preventing leakage and water-logging.

17. There are no village irrigation works in the Sholapur district like the *bāndhāras* in Nāsik and Khandesh and the irrigation tanks in Dhārwar and the Southern

Marāṭha Country. It is desirable to have such village works but I do not think there is any chance of their being constructed in these days, as it is impracticable to get the villager to co-operate to the requisite extent in getting up the required funds, and in abiding by the rules regarding the up-keep and repairs of the works when completed. A large private land-owner may occasionally come forward to construct a small tank for a *bhāudhāra* and channel. If such a man comes forward, he should be freely encouraged by Government to carry out the work by giving him facilities for acquiring the required land and for collecting rents for water which he may give to other cultivators.

18. I am not in favour of constructing small village tanks in the Sholapur district, unless adequate arrangements are made for their up-keep and maintenance. Some tanks of this character were made in the famine of 1876-77, but most of them have breached and are now in ruins. The works cannot irrigate lands, but they will be useful for water-supply for washing and village cattle. They will also raise the subsoil water level of the adjoining lands. The only agency that can be entrusted with the repairs of these village tanks is the District Local Board, but that body is too poor to undertake this additional responsibility. The Board can hardly get the required funds for keeping up the district roads in repair. I am afraid that under these circumstances the village tank construction must be abandoned. The works are so small and of such limited utility, that it is not desirable to expend any Provincial or Imperial funds upon their repairs, even if they are constructed from famine funds. The village tanks will generally dry up in the Sholapur district at the end of January, and they will be empty in the hot weather when they are wanted most.

19. There are no obstacles to the extension of irrigation in the Sholapur district arising from scanty population, insufficiency of cattle, unsuitability of the soil, lack of capital for initial expenditure or other reasons. There is want of manure in outlying villages, but this want will have to be supplied, as irrigation progresses by importation from outside. There is a good deal of night-soil, pondrette and other good manure available in the neighbourhood of cities like Sholapur, Pandharpur, and Birsī.

20. Extension of irrigation will have no tendency to injure the remaining cultivation of the district by drawing away capital and labour from the latter.

21. There are complaints under the older irrigation works in the district of lands being impoverished by constant irrigation, but this is due to want of manure and want of rotation. The same land is often irrigated year after year with similar crops, and impoverishment is the consequence. There are no other complaints regarding damage to irrigated lands or to the inhabitants of irrigated villages.

22. No drainage works are required in the Sholapur district, as the whole of it is naturally well drained by nalas and rivers. There is no water-logging or land thrown out of cultivation on its account. In irrigated areas also there is no necessity for drainage, as the lands irrigated mostly have muram at a small depth for their sub-soil.

23. The famine relief works carried out in the Sholapur district in 1896-97, 1899-1900, 1900-1901 famines consist of—

- (a) Roads, road repairs and improvements and metal collection for roads.
- (b) Earthwork for new railway lines and ballast collection for existing railways; and
- (c) Construction of irrigation tanks and repairs of existing irrigation works.

Fortunately in the last two out of the three famines the bulk of famine works expenditure was on classes (b) and (c) above.

The following six new tank works have been started as relief works in the Sholapur district and are still incomplete:—

1. Budihal Tank.
2. Bhamburdi Tank.
3. Pathri Tank.
4. Wadshivne Tank.
5. Hudgi Tank.
6. Mangi Tank.

Of these, I strongly advocate the early completion of the first 5. If completed at an early date they will add to the irrigated area of the district and protect considerable area from droughts and distress consequent on seasons of

scarcity. Nos 3 and 4 (Pathri and Wadshivne Tanks) must be completed before next rains, as their feeder nalas have been bunged up, and temporary waste weirs have been provided instead. These temporary waste weirs will develop into river-beds next rains, if not immediately closed and rendered unnecessary by the completion of the works as designed. Nos. 1, 2, and 5 are very useful works, and should be completed at an early date. No. 6 (Mangi Tank) is a useful work, but unfortunately the area under its command is limited. Its completion can therefore wait until the completion of other more remunerative schemes. All the six tank works under reference will much more than pay their working expenses when completed.

24. The water-rates charged are crop rates which are sanctioned by Government from time to time on proposals submitted by local Irrigation and Revenue officers. The scales of water-rates are generally fixed for three years. The areas of irrigation of crops are measured and assessment returns prepared by the Irrigation Department twice in a year for the kharif and rabi seasons. They are then sent to the Revenue officers for collection of irrigation revenue along with land revenue. Water applications are received for the crops to be grown, and when sanctioned water is given to the irrigators until the crops mentioned come to

maturity. The distribution from the main and branch canals and from larger distributaries is in the hands of Irrigation officers. After the water leaves the main canal and branches, the irrigators manage the distribution amongst themselves according to turns fixed by the Irrigation Department and under supervision of Irrigation officials.

25. In years of favourable and timely rainfall, canal water is not taken for ordinary kharif and rabi crops, and the extent of irrigation and irrigation revenue fall in consequence. In years of good and timely rainfall it sometimes happens that the storage in larger tanks is not fully utilised in irrigating perennial, eight months', and hot weather crops. Some of the stored water remains in the tank for use during next year. In the case of the Ekruk Tank some water has always to be specially reserved in the tank at the end of the year, as the water-supply of the town of Sholapur and of the factories established in it is dependent upon the tank. Any year may turn out to be a bad and rainless year which may not bring any replenishment into the tank. To guard against the contingency of such a year, it is necessary to keep sufficient water into the tank at the end of the year to meet the water-supply wants of the town during the succeeding year.

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1. Q. (The President.) You are an Executive Engineer, Public Works Department?—Yes; I am now on leave. I have been six years in Sholapur. I was there on duty during the last famine. I have been 28 years in the Department, and remember the famine of 1877.

2. Q. Much of the Sholapur district is irrigable by tanks and wells?—Yes; but these tanks generally depend on local rainfall. When the smaller tanks have been dry, I have seen the larger ones holding water, even in a year of bad rainfall. I say this from my experience of the last two years.

3. Q. With regard to wells, Government assistance would be confined to making takavi advances: do you think the terms should be made easier?—I would propose a longer period for repayment. I would make it 30 years, and reduce the rate of interest from 5 to 4 per cent.

4. Q. Supposing a wet assessment was put on the well instead of asking for a return of the takavi?—I don't think the people would like that.

5. Q. Not even if they got the money for nothing without interest?—No.

6. Q. Is there much difficulty in sinking wells in your district?—They are easily made; but it is difficult to get water, because the soil is 2 or 3 feet thick; below that there is murum, and below that again rock. You have got to get to the heart of the rock and to a soft layer.

7. Q. What does such a well cost?—About Rs. 300; but if the water is found soon, much less.

8. Q. Those are *kachcha* wells?—Yes. They last for 30 or 40 years with slight repairs.

9. Q. In paragraph 14 of your note you refer to the present system of establishment charges?—Yes, the establishment charged to irrigation works is too high. The maintenance charges are also high, too high. Ordinary maintenance of irrigation works does not require much professional knowledge, and could easily be entrusted to a lower paid establishment.

10. Q. You say that in the Sholapur district, irrigation is used for all kinds of soils. How deep is the thick black cotton soil?—Near the rivers, and nalas, 8 or 10 feet; in other places 2 or 3 feet. When I say all kinds, I mean even for sugar-cane.

11. Q. In paragraph 18 of your note, you say that you are not in favour of small village tanks in Sholapur, unless adequate arrangements are made for their up-keep?—Yes, some small tanks in the Sholapur district were made as famine works, and are out of use; some have been breached on account of insufficient waste weirs. The tanks were constructed, and no one was placed in charge of them; they were chiefly for cattle and drinking water purposes.

12. Q. Do you think metal breaking a good form of famine relief?—No, not unless the metal is really required for roads, and you can use all that is broken.

13. Q. With regard to the four tanks referred to in your note—in bad years they would not fill, but in good years would they fill?—They are not situated on perennial streams, and we cannot connect them with the ghâts, as Sholapur is on a high plateau. I think they would not fill in very bad years.

14. Q. (Mr. Higham.) You say that the Bhema and Seena are not feasible for canals, as the water supply is not perennial; the Bhema comes from the ghâts, does it not?—Yes; but even if storage reservoirs were put up, the water would have to be carried 100 miles down the Bhema, and in traversing that distance half of it would be lost.

15. Q. The Bhema is rocky in some places, and sandy in others: do you know whether there is rock under the sand?—I do not know. It gets dried up during the hot weather; the supply fails in April or May, though sometimes it flows perennially.

16. Q. Why do you say half the water would be lost in transit to the canal?—As Assistant Engineer, I took observations of the Pravara river in connection with the Maladevi tank, and I found that in about 40 miles there would be loss of 25 per cent.

17. Q. Is that on record?—Yes, it is most probably filed with the other records.

18. Q. Do you know of any other observations of a similar kind?—There were similar observations in regard to the Bhatgarh tank on the Nira canal. I have not taken observations in regard to the Bhema.

19. Q. What about the Seena?—That has its rise near Ahmednagar. The country in the Sholapur district is most unfavourable to irrigation. There are ravines round about, and cutting would cost a lot, while the area commanded would be small.

20. Q. Could not high weirs be adopted?—On the Seena river I tried to get sites for pick-up weirs, but could not get any. The banks of the river vary from 16 to 25 feet.

21. Q. You suggest that the waste water from the Nira might be picked up, how do you know that there is any?—There is bound to be waste water, as the water must return to the rivers. I have taken no observations. I took some observations in Khandesh, where we have the Panjra irrigation. It consists of a number of weirs, each of which irrigates a small block. We let the water out to feed the land under the *bandharas*, and it comes back to the river.

22. Q. Can you say from your own knowledge that there is waste water?—I cannot say.

23. Q. You say you would not make tanks with less than 12 square miles catchment?—Yes, the cost of construction is smaller with larger catchments.

24. Q. But the larger your catchment the larger the capacity of your tank?—Yes; but if we store a small quantity of water in a large tank, there will be much loss from evaporation. It is heavy in Sholapur, about 5 or 6 feet in the year. If you have a small tank, the spread is less.

25. Q. Supposing you design a tank to hold 100 million cubic feet and you have a certain catchment area; if you have short rain, you get only 50 million cubic feet; and if you have a smaller tank, you get only 25 million?—That would depend on circumstances.

26. Q. I imagine your objection to small tanks is that the cost of storage is greater compared with a large one? You say that if you make these tanks, the villages in the vicinity will become independent of relief?—Yes, we

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found this to be the case under the Ekruk, Ashti, and Koregaum tanks. In regard to all these, the villagers came in, but in very small proportions.

27. Q. You mean, some came in, but not the cultivator class?—The cultivator class came in when the famine had reached a serious stage and the tanks ran dry.

28. Q. The big tanks, as a matter of fact, did not fail in their supply?—Only the Koregaum failed. It has a catchment of five square miles. Very few cultivators from there went on relief works.

29. Q. Supposing new wells were made, do you think they would be worked regularly or only in famine times?—They would be worked regularly.

30. Q. What is the average lift?—The average lift would be about 25 feet.

31. Q. Are the people deterred from building wells by the first cost of construction?—Yes, in the poorer talukas.

32. Q. But the people depend on the ordinary rainfall?—On the ordinary rainfall and wells; they would work wells if they had them.

33. Q. You think the cost of maintenance might be reduced?—Yes, I would devise some means by which the establishment would be reduced. I would hand over some of the works to the villagers.

34. Q. In the Sholapur district, your establishment charges are small?—In Koregaum the revenue and expenditure are about the same.

35. Q. You say earthen dams can be made 70 or 80 feet high?—The Ekruk dam is 76 feet high, but it has slipped in places. The sub-soil gets water-logged when the drainage is inefficient. The Ashti tank is also giving trouble, which is due to the same cause.

36. Q. Have you any earthen dams that have not given trouble?—Almost all have given trouble.

37. Q. In regard to village tanks which you do not recommend, are there not some worth repairing?—Yes, they would make good famine relief works.

38. Q. The soil of Sholapur, what is it like?—The soil is mostly brown light soil; it overlays a bed of murum.

39. Q. Is it permeable to water?—Yes.

40. Q. With regard to the tanks which, you say, might be finished as they are half completed, what are they?—The Pathri and Wadshiye.

41. Q. You have had famine labour employed on these tanks for nearly two years?—Yes, as many as we could get. On the Pathri we could have taken more, but the famine was not severe there, and we had less labourers.

42. Q. Supposing you had ordinary labour and put as many men on as you had famine labour?—The smaller works would have been finished.

43. Q. Do you think that from the local villages, from which labour came, the men would have come to work for a contractor?—No, in ordinary years they would not have come in sufficient numbers to complete the work. Even professional labour would not have been sufficient to make any material progress with all the tanks.

44. Q. (Mr. Ibbetson.) You say in your memorandum that tanks will affect wells for 4 or 5 miles?—I have noticed that not only close to the nala, but within half a mile on both banks.

45. Q. In famine years do they benefit?—Yes.

46. Q. How far?—Within half a mile.

47. Q. I understood you to say that tanks do not pay the interest on their cost; that they just cover working expenses and some pay 1 per cent.?—The new tanks will only pay their working expenses.

48. Q. These tanks which are half finished by famine labour, if the cost of the famine labour was set aside, would they pay on what it would cost to finish them with ordinary labour?—Efficiently worked, they should return 4 per cent.

49. Q. Where you have got to hold up water, is the demand in excess of the supply?—In a good year the water is in excess of the demand. In bad years all the water is used.

50. Q. In good years they use the water for sugarcane?—Yes, and sometimes for rabi, when the rainfall is not seasonable.

51. Q. How many years out of ten would they take water for rabi crops?—Every year they take some, but in bad years the acreage is larger. Last year was the largest on record. It was a bad year of rainfall, and we used up all the water except in the Ekruk. We used up all the water in the Mhaswad tank also.

52. Q. Of the latter, 25 million cubic feet was sent to Pandharpur?—Yes, there was cholera there, and we were asked by Government to supply the town with water. We could have used it for irrigation.

53. Q. (Mr. Rajaratna Mudaliar.) Is the Mhaswad a protective work?—Yes, we are obliged to hold up water.

54. Q. Generally a large quantity of the water is not utilized?—We supply all demands, still a quantity remains over.

55. Q. Do you know that the working expenses are Rs. 18,000 and the revenue is Rs. 19,000, that is the average for ten years?—That is due to book charges; I don't think the actual cost of the maintenance is Rs. 5,000; the budget allotment varies from Rs. 5,000 to Rs. 6,000. We maintain no special establishment there.

56. Q. What does the maintenance staff of the district cost?—I cannot give the exact figures, about Rs. 2,000 a month.

57. Q. With regard to Koregaum and Ashti, the water is sufficient to irrigate the whole area?—The command area is always greater than the actual area irrigated.

58. Q. Do you think there is great scope for the construction of tanks in Sholapur. At present there are only four irrigation tanks?—Yes, there is some scope for tanks, if small ones are undertaken.

59. Q. Is the system of application in force in your district?—Yes, on all works.

60. Q. Considering the limited area irrigated by these works, is it not possible to dispense with applications?—In regard to some irrigation, it is possible, but a man might change his crop next year.

61. Q. Assuming that to be the case, the mere presentation of application does not dispense with measurements. You have to keep your records?—I do not think the system would work. In a famine year or a year of scarcity you would have 10,000 acres under rabi and the next year only 300. There are variations in the irrigated areas every year. The rayat generally changes for the sake of rotation, if for nothing else.

62. Q. But your measurements would be your record?—The measurements are made after the crop comes to maturity.

63. Q. Is there any hardship entailed upon the people in the matter of water applications?—In years of scarcity, we give the water in anticipation of sanction. We generally give water as soon as the application comes in, but not when there is a rush on the water.

64. Q. (Mr. Ibbetson.) You say in paragraph 24 of your note that the scale of charges is fixed for three years?—Yes, they are changed every three or five years. They are now fixed for five years. They may be altered at the discretion of the district officers.

65. Q. These frequent changes retard irrigation naturally to some extent?—I would make the period ten years; but I am not very strongly of opinion that it will increase irrigation, which is not retarded on this account.

66. Q. (Mr. Muir-Mackenzie.) Did I understand you correctly to say that, in ordinary years, your tanks are managed on purely commercial principles, and that you do not hold up any water on account of the possible demand for rabi crops?—Yes.

67. Q. Are you aware that there is a difference in these principles on the Nira Canal?—I have heard so.

68. Q. When the Collector asked for the supply of water to Pandharpur, did you object?—No, it was given on sanitary grounds, with the express sanction of Government.

69. Q. Have you made any observations with regard to wells, and can you tell us what the average cost of a *kachcha* well is?—I have not made any observations, but I know that the average cost of a *kachcha* well, with five feet built up for one mot, is about Rs. 800, and that it will irrigate about 3 acres.

TWENTY-SIXTH DAY.

Sholapur, 4th January 1902.

WITNESS No. 63.—MR. A. F. MACONOCHE, I.C.S., Collector of Sholapur.

Answers to printed questions.

1. The answers below refer to the Sholapur District and the Akalkot State attached to it. I have been Collector and Political Agent here since February 1899.

2. The average rainfall in each month for the last ten years has been as follows :—

Month.	Inches.	Cents.
January	0	9
February	0	42
March	0	47.4
April	0	41.6
May	1	9
June	3	77
July	3	28
August	3	45.4
September	8	54.6
October	3	46.8
November	0	88.5
December	0	3

Three, out of these ten, have been years of famine. We have not had good rain except in 1898 since 1895. In consequence there has been a most serious shrinkage of the sub-soil water. Every hot weather there is a scarcity of drinking water, to say nothing of that required for garden crops. The formation of the country being trap rock is unfavourable for wells. It is therefore of the utmost importance to impound by every possible means the scanty rainfall we do receive, and not let it run to waste, as at present, down nálas and rivers.

3. The area of the Sholapur District is 2,906,378 acres, of which the cultivable area is 2,478,970 acres. The proportion of the latter, which is protected by Government Irrigation Works, is 3 per cent., while that protected by wells is 3.2 per cent. In 1896-97, 99,388 acres were irrigated by wells. In 1900-01, on account of the scanty rain year after year, and wells, in consequence, running dry, only 78,849 acres were so irrigated.

4. There are no private or village irrigation works. The soil is red-brown (disintegrated muram) on the up-lands, poor in quality, but good enough to grow the ordinary food-grains. On the plains it is brown, of fair quality; in the low-lying lands and valleys it is black, of excellent quality. Both brown and black soil are irrigated. In a normal year the cultivation of food-grains, the staple of the district, is independent of irrigation, practically. But of late normal years have been rare. Ordinarily irrigation is resorted to for crops other than the staple food-grains, such as sugarcane, turmeric and plantains, which require water all the year round, 36 to 48 waterings, best rice, groundnut, chillies, onions, tobacco, which require water from June to January.

5. The obstacles to the extension of irrigation are the capricious rainfall, so often insufficient to replenish tanks and wells, the insufficient supply of manure, which the people employ so largely for fuel on account of the scarcity of wood, and the rocky formation of the country, on account of which much of the cultivable area is up-lands, insusceptible of command from reservoirs, while everywhere wells are more costly and less successful than in alluvial tracts.

6. Loans under the Land Improvement Act are readily taken by the people, both for the digging of wells and the construction of dams round fields to arrest the surface flow of rain. We get more applications than we can comply with. I think the interest might be reduced, or altogether remitted, in consideration of the fact that a well or dam tends to secure the payment of land revenue in the future; when a well has been sunk and no water has been found, I would remit the whole advance.

7. There is no movement of cultivators from unirrigated to irrigated tracts, because the land everywhere has nearly

all been taken up already, and there is no room for new-comers. The people are everywhere desirous of the extension of irrigation, seeing the benefits derived by the few lucky villages that are commanded by the existing works.

8. Irrigation increases the value of the produce of land by enabling the owner to raise two crops instead of one, and so make the land productive all the year round, also to raise more valuable crops, instead of the ordinary food-grains, to which he has to confine himself if he depends solely on the rainfall. I have seen no evil result from irrigation, nor heard of any, except that after about twenty years' continuous irrigation the land gets "tired." The remedy is to let it remain fallow for a year or two, and then manure it carefully before irrigating it again.

9. The Executive Engineer has submitted the necessary details regarding the tanks and canals in this district, which are in his charge. I am not able to supply any further information.

10. The average depth of permanent wells is about 40 feet. Some are as shallow as 30 feet and some as deep as 80 feet. The supply of water is mostly derived from percolation, and is liable to fail in a year of drought, either wholly or in great part. It does not become saline, except by surface contamination. The cost of a thoroughly built well in which two "mots" can be worked, with a solid masonry top, is about Rs. 2,500; while that of a roughly built one is about Rs. 500. The former lasts 100 years, the latter 20. The water is raised by a "mot" or leather bag dragged up with a rope over a pulley by two, four, or six oxen, according to the depth, yoked together, and walking down a slope from the top of the well. The average area commanded by a well is about 2½ acres if the crop requires watering throughout the season, and about 10 acres if the crop only wants watering occasionally. In a year of scanty rainfall a well will increase the value of the produce by about 50 per cent., but in a year of drought by much less, because the water is pretty sure to give out. In a year of ample rainfall it is not needed and is not used, for the rain is sufficient. I am speaking of the ordinary food-grain crops. But of course a well enables a man to grow another crop during the hot season of a superior kind in every year except a year of drought. The owner charges his tenant double rent for irrigated land. Government, however, does not raise the assessment on this account. The double rent is charged on the total area commanded by the well.

11. In this rocky formation it is a toss-up whether water is found at a particular spot, or not, and the sinking of a shaft often turns out to be labour wasted. The main difficulty of sinking one is the hardness of the rock. The people, however, understand blasting very well. Boring down with iron crow-bars for a distance of 20 feet or so at the bottom of blasted-out shafts where no water has been found is sometimes attended with success, and I have taken great interest in trying to encourage the adoption of this practice throughout the district not only in such cases, but also in cases of wells which usually hold water and have run dry on account of scanty rainfall. What set me on this track was a well I saw at Mádha in December 1900, where the shaft was sunk 56 feet through solid rock without water being found. The owner then got a long iron bar, slung it over a pulley, set three men to haul it up and down, and one man to guide the blows so delivered. In this manner he bored down 22 feet, and was rewarded by a flow of water bubbling up, sufficient to keep two "mots" working all day during the season, and irrigating 6 acres of land. I immediately bought a lot of long bars and distributed them among the Mámátdárs with instructions to lend them out to people who wished to try the experiment. I did the same thing in Akalkot, where the plan proved very successful. It was less so in the district, principally I consider from the want of zeal of the subordinate officials, who did not push the scheme as they should have done. I had previously bought a boring apparatus, but it gave no better results than the common iron bars; it had longer rods, but the rods had to be used as "jumpers" just like the bars, for of course in

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hard rock one cannot bore in the common sense of the word (i.e., drill with a circular twisting motion) without steam power and diamond pointed drills, which we did not possess. I attach a copy of a letter I wrote to the Superintending Engineer on Special Duty about this subject. Another letter, which I wrote to the *Times of India* in December 1900, about the well at Mádha, attracted the notice of Mr. F. J. Norman, an Engineer, resident in Japan, who wrote to me about the Japanese system of well boring which is called "Kazusa," and which he seems to consider very suitable to India, being cheap, rapid, and carried out with very simple apparatus. I have since been in communication with him, and I have reported the matter to Government for consideration whether it might not be advisable to get Mr. Norman to come over with a small party of expert Japanese well-sinkers to try experiments in different parts of the country and teach their system to the natives. I append a copy of my report. The Rev. Eric Lewis, a missionary, stationed at Betul in the Central Provinces, also saw my letter in the *Times of India*, and he wrote to me from England that he had been much interested in the same subject, and had tried boring with bars, as I had. His experience had shown him what we found here, that in the hardest trap rock one often strikes at various depths bands of soft decomposed rock which hold water, and that it is always therefore worth trial to go down a good deal deeper than the average native thinks of doing, who too often abandons the attempt in despair when after going down 30 or 40 feet through hard rock he still finds no water. I think that an explosion of dynamite in a deep bore-hole at the bottom of a shaft might often prove effective. If there is any water about, that ought to fetch it out. With the aid of the Executive Engineer I am going to try some experiments of this kind during the ensuing season. Whatever the means employed, I am in favour of well sinking being pushed on by every possible means. I should like to see a special well-sinking branch of the Public Works Department with parties in every district doing this and nothing else. If we had had such an establishment since the beginning of our rule in these parts, there might have been by now a well in almost every field. And as wells are made useless by the subsidence of the sub-soil water that has taken place in this district owing to long years of scanty rainfall, coincidently with well-sinking there should be a damming of the rivers and nálas to impound all the rain water that now runs to waste, and so cause it to sink into the ground and replenish the springs and bring the level of the sub-soil water up to its former height or above it. Government should bear the whole initial cost of these operations, for it would be money well spent in guarding against future famines. A special water rate could always be subsequently imposed to prevent excessive loss. As far as possible, the owners of the fields should be employed in the work, for they would bring to the task a personal interest that must obviously be lacking in a purely departmental agency. They would always rather make the wells themselves with a Government grant than have them made by Government for them, except as a free gift.

12. No temporary wells are made in this rocky tract except in the beds of rivers and nálas for the provision of drinking water during the hot weather. Government provide grants for this purpose in years of scanty rainfall.

13. I think that really scientific and decisive experiments in deep boring should be undertaken in the Deccan, to find out whether there is any water-bearing stratum below the trap rock that could be utilized either by the mere ascending force of its contents on being tapped, or by the employment of steam-pumps.

14. *Apropos* of steam-pumps, I think that there may be a great opening for their employment on the banks of rivers, and I would give special facilities and exemptions to enterprising land-owners who would set them up for irrigation of adjacent lands.

15. And I think that there is a large sphere of usefulness for windmill pumps. I have put one up at Akalkot, not an American one with a straight plunging stroke, which I do not think is sound, but an English one with a central revolving spindle, and the result is highly satisfactory. It works with the merest puff of a breeze, and in a tract like the Deccan where every year the wind blows so steadily and strongly just when irrigation is most needed, a machine like this is obviously of the greatest use. I have also put a Pulsometer steam-pump in another well at Akalkot, to supplement the windmill pump on windless days. It does the work of two "mots" at slightly less cost, and I think that this expedient is also well worth the attention of capitalist agriculturists. It has excited a great deal of local interest and study at Akalkot, and many

leading men from the villages come in to look at both machines and consider whether both or either, perhaps on a reduced scale, could not be applied to their and their neighbours' holdings.

16. In the two last years of famine our efforts have, as far as possible, been concentrated on large irrigation tanks, of which we kept seven under construction. None of them, I am sorry to say, have we been able to complete within the time during which the general distress lasted, a failure due to the magnitude of each task. Every one of them ought to be carried to completion, famine or no famine, for they will, when finished, afford protection to their vicinity against the frequent failure of the rains in this tract of country. The Pathri tank, in particular, should be finished at once, for on its completion depends, not only the irrigation of a considerable expanse of country, but the water-supply of Bársi town, with its factories and railway that every year at present suffers from a water-famine every hot weather, and has to fetch its supply from a nála a mile and a half distant, in which the Municipality, the Railway Company, and private gentlemen are reduced to dig holes to provide themselves with one of the primary necessities of life. Before the necessity of water-works of every kind in this part of the country all other sorts of works are insignificant. Where a village was fully protected by already completed irrigation works, there I found not a single soul going, or needing to go, on to relief works.

No. $\frac{D}{2813}$, dated Sholapur, 23rd August 1901.

From—A. F. MACONOCHE, Esq., Collector, Sholapur,
To—H. F. BEALE, Esq., Superintending Engineer on
Special Duty.

I have the honour to forward a statement showing the results of boring through rock for water in this district and the Akalkot State. You will see that while in many cases it was successful, in many other cases it was not. I never thought it would be uniformly successful. All I contend is that in this part of the country there is no need for a rayat to lose heart as he does at present when after going down 30 or 40 feet through rock he finds no water. There is always a fair chance that by going down 20 or 30 feet more he may strike a fault in the rock or a stratum of red earth ("geru") or decomposed laterite which will yield water sufficient for one or two seasons' irrigation and availing to pull him through the bad times of drought.

Statement showing the names of the villages in which water-supply was improved by the boring of wells with iron-bars provided by Government.

Serial Number.	Name of village.	Original depth of the well.	Depth of the hole bored.	Whether water was tapped or not.
SÁNGOLA.		Fect.	Fect.	
1	Chopdi	16	4	Water-supply improved.
2	Rajuri	22	4	Do. do.
3	Achkdani	14	6	Do. do.
4	Sonalwadi	12	3	Do. do.
5	Manegaon	24	7	Water is tapped, but it does not rise above the mouth of the hole.
6	Shirbavi	24	6	No water found.
7	Sángola near Post Office	10	12	Do.
8	Do. New Peith.	30	12	Do.
9	Do. Mahomed-an well.	...	9	Do.
10	Do. Ator's well	10	9	Do.
11	Do. well near Laxmi's temple.	86	9	Do.
SHOLÁPUR.				
12	Uiha . . . .	...	9	Below this depth the bar could not work.
13	Hagllur . . . .	..	5	Some water was found after blasting one foot of rock.
14	Chincholi Kati . . . .	...	...	The work was abandoned.
AKALKOT.				
15	Sangvi Budruk	15	11	Three feet of water enough for the working of one môt.
16	Saphale	25	9	Four feet of water enough for the working of two môts.
17	Chapalgaon	20	12	Three feet of water enough for one môt.
18	Shirwal	36	9	Two feet of water enough for one môt.
19	Do. . . .	30	9	Two and half feet of water enough for one môt.
20	Akalkot Sháhátág	35	10	Three feet of water enough for one môt.

In Mádha Táluka no experiments were made with the iron bars.

In the Pátils' well at Mádha, the water rose 6 feet and lasted for four months when he used his own bars for the first time irrigating 6 acres. When the water began to diminish, the Pátíl again bored the holes deeper and the water rose 3 feet. The present height to which the water rises is only one foot.

In Málsiras the experiments were not successful.

In Bársi ditto ditto.

In Karmála in one case the water was found and in two other cases it was not.

In Pandharpur, in one case only the experiment was attended with any success, and in others it was a failure.

No. ^D₃₃₅₇, dated Sholapur, ^{18th}_{19th} October 1901.

From—A. F. MACNOCHIE, Esq., Collector, Sholapur,
To—The Hon'ble SIE A. WINGATE, K.C.I.E., Commissioner, C. D.

Last December I was much interested by a successful experiment at Mádha of boring deep through solid rock for water. The owner of the well blasted down 56 feet without finding water. Then he got a long iron bar and drilled down 22 feet more, with the result that he obtained a bubbling flow of water that was sufficient to irrigate six acres throughout the whole season. I brought this to the notice of Government in one of my Famine Progress Reports, and also wrote a letter to the *Times of India* about it. I also set similar borings in progress in every táluka of the district with the result that in about 50 per cent. of cases water was obtained in previously dry wells. I have already communicated these results to Mr. Beale, and he has the matter under consideration. I believe that my example was followed in Ahmednagar with good success. My letter to the *Times of India* attracted the notice of Mr. F. J. Norman, an Engineer in Japan. He wrote to me in May on the subject, and I have since been in com-

munication with him. It appears that in Japan they have a peculiar system of boring called "Kazusa" which enables one with simple appliances to drive bore-holes down to great depths in search of water, and that the results obtained are excellent. Mr. Norman has sent me a sample of the bamboo piping used, and also samples of the strata met with at depths of 300 and 720 feet at his own residence Kaikikan. I annex them. Unfortunately the samples of soil got mixed up in the opening, but they are of much the same nature. The fragments of shells indicate a marine deposit.

2. You will see from the enclosed papers that Mr. Norman is anxious to be employed by Government to teach the people of India the "Kazusa" system of boring. He undertakes to bring with him three first class Japanese well-borers. He states the terms on which he would be willing to do this, and asks for an eight months' contract, saying that a telegraphic remittance of 2,500 yen would be followed by the embarkation of himself and his party within a week from its receipt.

3. I think the experiment is well worth trying. I do not know whether the Japanese methods would be of much avail in the trap rock of the Deccan, but I imagine that in an alluvial tract like Gujarát they might very probably prove of the utmost value. The ingenuity and efficiency of Japanese workmen with the simplest appliances are notorious. There is much force in what Mr. Norman says in his last letter to me: "The Japanese are a wonderful people, and have many ways of doing things that are for an uneducated and semi-barbarous people infinitely superior to the ways we accidentally would force upon them, irrespective of the fact that they have not been educated up to our ways and methods. I do really think their half-way methods, such as the 'Kazusa' system, are more applicable than our own advanced and scientific methods, that is where people like the Indian rayats are concerned. We work above their levels. Japanese officialdom works down to their levels. There is a mean, but the difficulty is to find it."

4. Commending this subject to the favourable notice of Government.

1. Q. (*The President*.) How long have you been here?—Nearly three years.

2. Q. All through the famine?—Yes.

3. Q. You say in your note, "In this rocky formation it is a toss-up whether water is found at a particular spot or not, and the sinking of a shaft often turns out to be about wasted." You mean on account of the hardness of rock and the uncertainty of finding water?—Yes.

4. Q. You don't find salt in the wells?—No.

5. Q. You attach great importance to the extension of well irrigation?—Yes, combined with measures for raising and maintaining the level of the sub-soil water, such as damming *nalas* and also putting anicuts across the rivers and running off the water into storage tanks at the side.

6. Q. Your view being that the first object in damming the rivers is to check the too rapid flow of the surface water and allow of its sinking into the sub-soil?—Yes.

7. Q. That is quite apart from direct irrigation?—Yes, for the sake of the wells.

8. Q. You say in paragraph 10, "The cost of a thoroughly built well in which two 'mote' can be worked with a solid masonry top is about Rs. 2,500." That is a high price?—That is an outside price for a very good well.

9. Q. Are many such built?—Not very many.

10. Q. I suppose they are built by *takavi* advances?—Yes, a great many, and a great number from the people's own resources—I find in the last 10 years that 1,910 wells were built with the help of *takavi* and 2,876 at the *rayats'* own cost.

11. Q. (*Mr. Ibbetson*.) Does that include *kachcha* wells?—Yes, a *kachcha* well means sunk through rocks, without a mortar and stone wall at the top. In the *kachcha* well the wall is made of dry masonry, and is a very solid thing indeed.

12. Q. (*The President*.) The *kachcha* well has a long life?—Yes, it has a longer life than in Gujarát.

13. Q. Are there any *kachcha* wells without any masonry at all?—I think not.

14. Q. The really expensive part of the well is done when the trap has been pierced?—Yes.

15. Q. Up to what amount do you give *takavi* advances if a man was going to build a well costing say Rs. 2,000. What would he get from Government?—It depends upon how much land he has got and what security he has to offer. In one case we advanced Rs. 10,000 in the case of an enormous well 100 feet long and 30 feet deep.

16. Q. How much did the man spend?—I think he spent Rs. 30,000; he has six to eight motes going night and day, and hopes to be repaid.

17. Q. How much irrigation is there under the well?—I don't know the exact area; it is something very considerable.

18. Q. That is quite exceptional; supposing a man is going to build a well costing Rs. 2,500, what would be the amount to be reasonably expected from Government?—If we had an ample allotment, I would give him the whole amount.

19. Q. Would that be pretty often done?—My experience has been that one-half or two-thirds is generally given. I think it would depend on the allotment at our disposal; if there were many applications, we should not give more than half.

20. Q. Do you spend your allotment every year?—Yes, of late it has been increased; last year we disbursed 3 lakhs, the year before 3½ lakhs.

21. Q. (*Mr. Ibbetson*.) Was that largely for seed nad bullocks?—Yes, but more than half for wells.

22. Q. (*The President*.) Have you ever applied for an increased allotment?—Yes, and my demands have been always met.

23. Q. You have not been restrained by want of money from granting *takavi*?—No.

24. Q. You say in paragraph 6, "We get more applications than we can comply with. I think the interest might be reduced or altogether remitted." Do you think if the interest was reduced, it would make much difference?—I think perhaps it would be a greater inducement if the period of repayment were extended and the instalment reduced.

25. Q. What is generally the period of repayment?—Up to 10 years.

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Mr. A. F. Maconochie. 26. Q. I understand the legal time is up to 20 years; why is it generally shortened? Is it nervousness on the part of the Mamlatdar that something may go wrong and that he may not get the money back?—I think there is anxiety to get the money back as soon as possible.

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27. Q. You think the time might be extended at least to 20 years?—Yes.

28. Q. How much do you think it might be extended to?—I mean extended up to the full 20 years. I don't think it would be wise to extend it more than 20 years—unless the man himself proposed to return it sooner, I think the full concession might be granted.

29. Q. The law is, I understand, that if a man at his own cost constructs a well, he shall not be charged extra assessment?—He is not charged anything extra during the currency of the existing term of settlement.

30. Q. He is not charged in all future settlements I am given to understand?—I confess I thought that he would not be charged extra during the continuance of the existing settlement, but that some enhancement would be put on at the next.

31. Q. That seems the general impression, although apparently the law is more liberal. It has been suggested that, instead of asking a man to repay the *lakavi* advance at all, he might be made to pay an addition to his assessment—a wet rate instead of dry; do you think that would be a popular method of proceeding?—Yes, I think it would be popular—it would be a very good thing to try.

32. Q. In paragraph 11 you give an interesting account of what has been done to deepen wells; it has been attended with a good deal of success?—Yes, there were also many failures, but still we got success in so many cases that it seems worth trying.

33. Q. Do you know what is the cost of boring per foot through trap rock?—Very little indeed—it would be the wages of three men at three annas per day.

34. Q. How far would they get in the course of the day?—About a foot.

35. Q. That would be nine annas a foot?—Yes.

36. Q. You have had correspondence with Mr. Norman in Japan and reported the matter to Government suggesting that it might be advisable to get Mr. Norman to come over. What was the reply?—I have not got a reply.

37. Q. Did you write lately?—Yes, the letter was sent to the Superintending Engineer for report by the Commissioner. I don't think it has reached Government.

38. Q. You say that with the aid of the Executive Engineer you are going to try some experiments with dynamite in searching for water. Have you had time to make any experiments?—Only one.

39. Q. Do the villagers readily get hold of dynamite?—No, we had great difficulty in getting it up; we got it from the Agents of Messrs. Nobel & Co. in Bombay, but it was at the wrong time of the year; the railway company would not carry it then except on special terms, and we had to take a whole waggon for a small quantity of 100 pounds; it is dangerous stuff; if the rayats handled it, they would, I'm sure, blow themselves to pieces; they only understand blasting with native powder.

40. Q. They get that easily?—Yes.

41. Q. You think there might be a special branch of the Public Works Department going about to cover the country with wells?—Yes, I should like to see some decisive boring, through this trap rock, going down 1000 feet if necessary, to see if we can get into another formation that bears water, nobody here can afford to conduct such experiments.

42. Q. I suppose the Geological Department cannot enlighten us on the point?—I don't think so.

43. Q. In paragraph 14 you suggest the employment of steam pumps; are there any in this district?—There is only one in Akalkot, it is a pulsometer, we use that on windless days, when the wind-mill pump will not work. I know of another man who had a steam-pump in the Baroda State, where it was very successful.

44. Q. Have you heard of any tendency among the agriculturists to start anything of that sort?—There are a few who are thinking of it, but I don't think the idea has struck them generally yet.

45. Q. It would be a great saving in cattle?—Yes, a great saving, but a difficulty would be fuel.

46. Q. You allude in paragraph 15 to windmill pumps; you say there is one at Akalkot; have you got any statistics as to what amount of water it raises or what is the amount

of irrigation done by it?—It is not for irrigation, but for the supply of water to the town. Our big well of 40 to 50 feet ran dry, and this pump put in water at the rate of a foot an hour; the cost of the windmill is Rs9,000.

47. Q. You have not seen it tried for irrigation?—No. One day with a strong breeze it pumped water 104 feet high.

48. Q. How deep is the well, approximately?—Thirty or 35 feet deep, I think, with $4\frac{1}{2}$ feet of water in it.

49. Q. You say in the last paragraph, "In the two last years of famine our efforts have, as far as possible, been concentrated on large irrigation tanks, of which we kept seven under construction. None of them, I am sorry to say, have we been able to complete." You think they should be carried on?—Yes.

50. Q. Do you mean without waiting for the next famine?—Yes, as ordinary public works; the Pathri tank should be the first, because it is most nearly nished.

51. Q. You attach importance to it because of its helping the town of Barsi?—Partly and also on account of irrigation.

52. Q. Mr. Beale says it would submerge 818 acres and irrigate 1,234, so that it would not be very useful?—We have taken up all the land that is to be submerged and paid compensation, so that I think the work should be started.

53. Q. Have you always done that?—We have not taken up the whole of the area in all cases, but in the case of Pathri and Vadshivne we have taken up all the land that is to be submerged, for the rest we have only taken the land required for the work.

54. Q. As regards sites of possible reservoirs, I suppose those you know are among those noted on by Mr. Beale?—Yes, the most important ones are those in the south-west, because that is the most distressed area.

55. Q. (*Mr. Higham.*) You say at the end of your memorandum "Where a village was fully protected by already completed irrigation works, there I found not a single soul going or needing to go on to relief works." What do you regard as being fully protected?—A canal running right through the middle of the village.

56. Q. What proportion of the cultivated area of the village should be fully protected in order to keep people off relief works?—I think 50 per cent.

57. Q. You think you must have 50 per cent.; less than that would not do?—I am not sure.

58. Q. Have you not thought of it?—No.

59. Q. Take the villages that are protected by the Ekrak tank, for instance; do any of the villagers from there go on to relief works?—Very few, I am sure. I cannot tell for certain. I was thinking particularly of Waki village on the Mhasvad canal to which I went and enquired how many of the inhabitants had gone to relief works, and was told not one had gone.

60. Q. The Mhasvad tank irrigates on an average 6,500 acres and in the famine year, 1899-1900, it irrigated 13,000 acres, so that it did very well that year; taking the whole of these villages in this tract, would it be possible to ascertain roughly what proportion of the population had gone to relief works?—I think we could find it out.

61. Q. We should require—

- (1) Cultivated area.
- (2) Area irrigated.
- (3) Population.
- (4) Numbers on relief, including gratuitous and all forms of relief.
- (5) Area matured.

62. Q. There is no record in the village of how many people had gone to relief works?—No.

63. Q. I suppose the village patel could give a fair idea?—Yes.

64. Q. Here in Bombay did the people go to the nearest work or did you draft them to a distant work?—We didn't keep them off the nearest work in 1899.

65. Q. Were you in charge of the district in 1896-97?—No, I was at home.

66. Q. I remember when we came round here in 1899, we found that the labourers from many villages in Sholapur were sent to the Shetphal tank?—Yes, that was enforcing the distance test; this time we had no distance test.

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67. Q. Have the muster rolls been destroyed by now?—I am not quite sure about that.

68. Q. In that case you must rely on the Patel; still there must be some sort of information available for the Ekrak tank?—Yes, I think so. I shall get it out.

69. Q. I understand you to say that something should be done by constructing weirs across the beds of the different rivers here for holding up water?—Yes, I should hope to see that done.

70. Q. Have you any idea of the places where that could be done?—It is merely a general impression of mine.

71. Q. Would you propose that Government should build a weir and let the people take all the benefit they could out of it?—I think it might be possible to run water into storage tanks.

72. Q. I'm afraid the country does not lend itself to that; do you think it would be worth while to collect the water for purposes of lift?—Yes.

73. Q. In that case I suppose the people would not be able to pay anything for it, or would you put a water rate on?—Yes, I would put on a water rate.

74. Q. You could not increase the assessment for lands that are irrigated by a work of that kind?—I don't see why the assessment should not be increased if the land is improved.

75. Q. It could not be increased till the next settlement?—Yes, it could, by putting on a water rate.

76. Q. The whole area would have to be measured up; the difference between imposing a water rate and increasing the assessment is that in the latter case people are left more to themselves in the control and distribution of water?—I don't see why the area irrigated could not be measured up; the village staff could do that.

77. Q. You say in paragraph 10, "The cost of a thoroughly built well in which two mots can be worked, with a solid masonry top, is about Rs. 2,500, while that of a roughly built one is about Rs. 500. The former lasts 100 years, the latter 20." Under these circumstances, would it not suffice to build the cheaper one? All that would fall down in 20 years would be the dry masonry at the top?—There is always an upper stratum of earth and moorum that would fall in; Rs. 2,500 is an outside limit for a masonry well.

78. Q. Are not *kachcha* wells good enough?—Yes, for all practical purposes.

79. Q. You say the average area commanded is 2½ acres; do you mean only 2½ acres of crops are raised on each well in the year, or may not two or three crops be raised on the same land?—Yes, several crops.

80. Q. Do you mean the area actually commanded or the area that is cropped every year?—The area to which water can be supplied.

81. Q. That might mean more than one crop?—Yes.

82. Q. I think they have generally more than one crop on the well?—Yes.

83. Q. Is the area that you have given for a well of two mots or the area for each mot?—For one mot.

84. Q. Your big well costing Rs. 2,500 would contain two mots?—Four mots.

85. Q. You say you think it would be a good thing if Government would make wells and charge a wet assessment on them?—Yes.

86. Q. In that case do you think wells should be made by Government officers of the Public Works Department or others, or would you give the money to the people and tell them to make them themselves?—The people could do it cheaper and would prefer it.

87. Q. You would give *takavi* advances and make a perpetual charge?—Yes, instead of requiring them to repay the loan.

88. Q. It would practically be equivalent to that; you would advance the money and require them to pay so much a year for extra land revenue. Do you think that would be worth trying?—Yes, I think so.

89. Q. Would there be any objections to it?—I don't see any.

90. Q. If a well failed, Government would have to rebuild it?—There would have to be some understanding about repairs. I think the man would be sure to keep it in repair himself.

91. Q. You spoke of the Pathri tank as one that should be completed at once, because the Barsi town and Municipality are interested in it?—Yes, and the railway.

92. Q. Did they make any contributions towards the cost, or do they pay for the water?—They don't pay for the water; they have not contributed anything towards the cost of the work; the Municipality have agreed to take up a loan for bringing the water into the town; they could not expect to get the water for nothing.

93. Q. I suppose you could not charge them very much?—No, they are rather a poor Municipality.

94. Q. Have factories applied for water?—I think they would agree to take it, the railway has promised to pay for the water supplied.

95. Q. The tank could not supply much for irrigation if it has to supply all this?—That would seriously diminish the water for irrigation.

96. Q. You would always have to keep up a certain minimum supply for the town?—Yes, it would be like the Ekrak Tank.

97. Q. Nothing has been settled about what they would pay for it?—No, no one knows if the tank is to be completed.

98. Q. Would it facilitate completion if arrangements could be made as to what they should pay?—If Government saw their way towards getting some return, they would carry the work to completion.

99. Q. In regard to taking up land for the small tanks that are proposed, is it necessary, do you think, to take up all the land that would be submerged; do you think the people themselves wish it taken up or would they prefer to be allowed to cultivate it?—They would prefer to retain it.

100. Q. If the people themselves are not very anxious, ought it to be considered whether we might not allow them to retain the ownership?—One never knows how much land will be submerged.

101. Q. I think all the land that is submerged could be cultivated; if the people who own it were allowed to retain it, it would probably make the works more popular and it would reduce the cost of water. I understand in this tract you have actually purchased the land?—Not all.

102. Q. Have you known cases in which the owners of land have objected to its being taken up; I suppose you notify it under the Act?—We have been settling it by private arrangement; in one case it is doubtful if the land will be submerged every year and we have allowed the owner to retain it; he says he won't claim any damages if the land is submerged; we paid no compensation to him. But the deeper land always is submerged. I don't think our tanks ever run quite dry.

103. Q. There must be a large area round the edge that is dry in dry years and might be cultivated?—Yes.

104. Q. Where did this windmill come from?—From England; it was ordered out by the State and cost altogether Rs. 9,000.

105. Q. Have you any idea of the quantity of water it raises?—No; I have never had it measured.

106. Q. How high does it lift water?—About 25 to 30 feet; it is then run through pipes into another well, whence it is lifted into the reservoir; it is for the water-supply of the town.

107. Q. Wherever you have a wind-mill for water-works, you would require an oil engine or bullocks to work when the wind fails?—It would be a useful supplement, but the breeze is pretty steady during March, April, and May.

108. Q. It can be relied upon then?—Yes.

109. Q. If lifting machinery is put on to these Government streams, would Government want to charge any royalty for the use of the water?—Yes, I suppose they would.

110. Q. Are there Government orders to that effect?—Yes, we charge for water raised from *nalas* now (a patasthal charge).

111. Q. Is that rate charged in this district?—Yes, but rarely.

112. Q. How is the water raised,—by bullocks?—Sometimes by bullocks, sometimes by hand lifts.

113. Q. What is the amount of the charge?—Rs. 3 per acre.

114. Q. What is the total amount?—Something very small, only a few hundreds of rupees.

115. Q. (Mr. Ibbetson.) You say that when a man builds what has been called a *kachcha* well, he builds up dry masonry from the surface of the rock to the top; how long would a well of that sort last on the average?—About 20 to 25 years.

Mr. A. F. Maconochie. 116. Q. What would be the cost of a two-mot well?—Rs. 500.

4 Jan. 02. 117. Q. As much as that?—I think so; it depends on the size of the well; it would probably be within Rs. 500.

118. Q. Something like Rs. 500?—Yes.

119. Q. Then setting aside your Rs. 2,500 well, which is a luxury, supposing that instead of spending Rs. 500 on a well to last 25 years, a man wanted to make one to last from 50 to 75 years, that is to say, to build it with mortar and masonry, what would the cost of that be?—It would cost from Rs. 750 to Rs. 1,000.

120. Q. He would get double the life of his well at less than double the cost?—Yes.

121. Q. The President made a suggestion that the most expensive part of a well was finished when the blasting had been done; you seemed to assent, but I am not quite sure if you did, have you considered the point?—No.

122. Q. You say if you had many applications for *takavi*, you would probably give a man only half the amount he asked for so as to spread the benefit over as large a number as possible; does that not mean often that he cannot make a well at all, or that he makes a very inferior well which is in the end more costly; would it not be better to give the full amount asked for to half the number of people who had made applications and let them make thoroughly good wells. I am referring to ordinary years, not famine years?—I think they are apt to ask for more than they really want.

123. Q. I don't mean to give as much as they ask for, but only enough to make a good sound well to last say 50 years?—Yes, I think it is.

124. Q. You say that the amount advanced to a man depends on the value of the security he offers, that is the unimproved value of the land?—Yes.

125. Q. Your loss in *takavi* by irrecoverable advances is very small?—Yes, apart from the famine.

126. Q. Is that wholly due to the caution that is exercised by your *Mamlatdar*, or in part or mainly to the feeling amongst many people that the *takavi* loan is a debt of honour; does that feeling exist here?—I am afraid it does not exist.

127. Q. You don't think it would be safe in making advances to go beyond the value of the land as it stands, in consideration of the fact that, when a well is made, the value of the land will be doubled. Do you think you might be bolder than you are at present in the matter of advances?—I think in view of the uncertainty of striking a good supply of water or perhaps getting any water at all, it would not be very prudent.

128. Q. Supposing Government safeguarded itself, first by a trial boring so as to satisfy itself about the water; and secondly, in order to make sure that money was being spent on the well, by advancing the money in instalments; with these two precautions do you think it would be safe to lend beyond the value of the land?—I think it would be rather risky.

129. Q. The reason I ask is that we have been told by several people that a serious obstacle to the extension of well irrigation is the difficulty of getting enough money to make a well; Government is ready to advance something, but half the amount is no better than nothing if the rest of the money cannot be got; therefore I am anxious to know what you think about more liberal advances?—(No answer.)

130. Q. You say you would not extend the period of repayment of advances over twenty years; but you are prepared to substitute wet assessment as a permanency; what is the advantage of the wet assessment over the instalment principle?—I think perhaps it would be more popular.

131. Q. Why should it be more popular; why not extend your *takavi* period if necessary beyond 20 years?—Would it not mean more Government money outstanding; can Government afford to get it back so slowly?

132. Q. It would mean even more than that; if you only take wet assessment, it would practically be a permanent loan?—Yes, earning good interest.

133. Q. I don't quite see the objection to extending the period of twenty years if you are prepared to adopt the other system?—(No answer.)

134. Q. Supposing you imposed a wet assessment, I presume the best well must fail in course of time, and you could not go on recovering the wet assessment after the

well had ceased to be workable, could you?—I suppose you would have to mend it.

135. Q. Is that always possible; is it not sometimes cheaper to build a new well, when a well gets to a certain age?—In the case of a well sunk through rock it would be cheaper to clean out the old shaft.

136. Q. You don't think there would be any limit practically to the age if the well is repaired?—No.

137. Q. Did you make any use of the notification in regard to increase of powers to subordinates for granting advances?—We only gave increased powers to *Mamlatdars*, and we employed certain head *Karkuns*.

138. Q. How did that work, was it satisfactory?—Yes.

139. Q. Would you be prepared to alter your rules and give increased powers to lower revenue officers than now have the power?—No.

140. Q. At present only the Assistant and Deputy Collector have the power?—Yes, and the *Mamlatdar* for small amounts.

141. Q. Would you advise giving the *Mamlatdar* increased power?—Yes, I think so.

142. Q. Would you limit the amount to Rs. 100?—I think they might be given power to Rs. 300.

143. Q. You say in your note that there have been four famines in Sholapur in the past 25 years. When did they occur?—In 1876-77, 1896-97, 1899-1900, and in the past year.

144. Q. Is the whole district subject to famine?—Yes, the two eastern talukas, Barsi and Sholapur, less than the rest.

145. Q. Were many *kachcha* wells made during the famine?—I think the majority were *kachcha*, but I have not got separate figures.

146. Q. By *kachcha* I understand you to mean dry masonry?—Yes.

147. Q. It has been suggested that people should be assisted by grants-in-aid to make them *pakka*. Do you think that would be a good thing?—Yes, I think it would be—it would prolong the life of a well.

148. Q. How would you set about it?—By giving them additional *takavi* for mortar and labour.

149. Q. Would they take it to make their wells *pakka*? We might give it on very easy terms, perhaps charge no interest?—I think they would be glad to take it.

150. Q. You think that would be a good thing to do?—Yes.

151. Q. You say that in a normal year the cultivation of food-grains is independent of irrigation. Does that include *rabi* crops?—Yes.

152. Q. You have no winter rains here like they have in Northern India?—No.

153. Q. Would you ordinarily in a fair year get fair *rabi* crops without any irrigation at all?—Yes.

154. Q. What interest does a *bania* charge if a fairly well-off tenant borrows money to build a well. I mean an ordinary solvent tenant, not an extraordinarily well-off man?—Not less than 12 per cent.

155. Q. Wells are used ordinarily for garden crops, the highest form of cultivation, and sugarcane, are they not?—Yes.

156. Q. With regard to these wells that you would like to make all over the district, do you contemplate their being used for that form of cultivation?—Yes.

157. Q. Do you think the supply of manure would be sufficient for them?—Yes, I think so, because the number of cattle would increase.

158. Q. I suppose it is only a man who is fairly well off who could go in for that kind of cultivation; it is expensive; there is a good deal of labour and manure required; do you think people would use their wells to the best advantage?—I think the people might be trusted to do that.

159. Q. You propose that Government should make them or pay for their being made?—Yes.

160. Q. How do you propose that Government should recoup itself?—By increased assessment.

161. Q. With reference to this case that you quote in paragraph 11 of a well in Madha where a shaft was sunk 56 feet without water and eventually water was found by boring 22 feet deeper, did the water rise in the well?—Yes

162. Q. To what depth?—There was 6 feet of water every morning in the well, the owner drew that off by evening and again next morning there was 6 feet of water in the well.

163. Q. Did he lift the water 78 feet (56+22)?—No, he had to lift it 30 feet.

164. Q. You said just now there is very often no water to be got, we have been told that, supposing a well was made regardless of cost in all parts of the Deccan, where they could be made, even then we could not irrigate more than one-tenth of the cultivated area; what do you think as regards your district, supposing you had a well wherever it could be worked profitably; is that a low or a high estimate?—It sounds to me a low estimate.

165. Q. Would you double it, at any rate it would be a small proportion, it would never be anything like one-half?—No, nothing like one-half.

166. Q. You say in paragraph 14 "*a propos* of steam-pumps I would give special facilities and exemptions to enterprising land owners who would set them up for irrigation of adjacent lands." What sort of encouragement has suggested itself to you?—I think I would exempt them from any charge for water for the first ten years.

167. Q. The Bombay Government has given them leave to irrigate a certain area free of charge; is it best to limit the area or limit the term and let them irrigate as much as possible?—I think to limit the term.

168. Q. You say in paragraph 15 I have also put a Pulsometer steam pump in another well at Akalkot to supplement the wind-mill pump on windless days. It does the work of two mols at slightly less cost. Do you include the deterioration of machinery and interest on capital cost in working that out?—No, I have not worked it out, that is only what the Administrator told me. I could get it worked out if you like.

169. Q. Yes, please, I should like to know. In any case the fact has to be considered that the men and bullocks for whose labour the Administrator will charge in calculating the cost of well irrigation must be there to a large extent and lie idle if the pump does the work for them?—Yes, that is so. I suppose they could be employed elsewhere.

170. Q. Speaking of protected villages where no one went on relief, were there any well-irrigated villages?—No, I was thinking of Waki.

171. Q. What is the history of wells in the famine?—A great many gave out.

172. Q. When?—In 1899-1900. We have not had good rainfall since 1898, either wells ran dry or the supply of water failed.

173. Q. Next year?—In 1900-01 they were worse still, the irrigated area sank from 99,000 to 78,000 in four years notwithstanding the *kachcha* wells made.

174. Q. Do you know whether before the famine wells were lying disused?—I don't think many were disused.

175. Q. You were not here?—No.

176. Q. (Mr. Rajaratna Mdlr.)—In paragraph 3 of your memo. you give the cultivable area. What is the occupied area?—It is nearly all occupied, there is very little waste, I have not got the figures.

177. Q. (The President.)—Have you any reason to believe that the population has gone down since 1896 in this district?—No, it has not increased as rapidly as it otherwise would have done; the census gives a decrease of 30,000, that is due to emigration, 50,000 to 60,000 people went to Berar, but many people have returned, in fact there has been a small increase I am sure.

178. Q. (Mr. Rajaratna Mdlr.)—Mr. Lawrence shows a large area under "other sources."—What is that?—It is not a large area, only 2,000 acres from *nalas*.

179. Q. It has decreased from 6,000 to 2,000, what is the reason of the decrease?—*Nalas* running dry; there has been a scanty rainfall for so many years running.

180. Q. In the past ten years large sums have been advanced for wells; do you know the number of wells constructed or repaired?—1,910 were constructed and 2,778 repaired.

181. Q. What steps are taken to see that the 7 to 8 lakhs that have been advanced for wells have been properly utilized, are the wells inspected?—Yes, the Mamlatdar inspects them.

182. Q. Are they required to send in a report?—There is no regular system of inspection.

183. Q. I suppose you grant advances in the lump and not by fixed instalment?—Yes.

184. Q. So that there is practically no check as to how much has been really spent on the wells?—Enquiries are made and if a case is found out of money not being properly spent the whole advance is recovered in a lump.

185. Q. There is no systematic inspection?—No, no returns are sent in.

186. Q. On the Ekruk tank we found that the highest area irrigated was under 5,000 acres in 1899-1900 and the average area about 3,200. Is there any possibility of extending irrigation?—I think the Public Works Department had better be consulted on that point, the question of Ekruk is complicated by the water-supply of the town, the railway and the mills. I don't think there is much chance of increasing the irrigation from that tank.

187. Q. Are there any wells to supplement the irrigation from the tank?—I believe there are the usual number.

188. Q. Within the area commanded by the tank?—Yes, I believe like any other village they have the usual number of wells.

189. Q. Is the system of application for water in force under this tank?—I think so, I have not studied the subject.

190. Q. I ask the question because the Executive Engineer is not coming for examination?—I think he has referred to it in his written reply.

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Maconochie.
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WITNESS No. 64.—MR. H. L. PAINTER, I.C.S., Assistant Collector, Sholapur.

Answers to printed questions.

I.

I must preface my remarks by saying that my experience of the Deccan is confined to the last nine months, during only about three of which I was travelling in the district. All my previous experience is of Gujarāt. Consequently the information which I have personally acquired is small as regards the Deccan.

I now take the points in the memorandum on which I am capable of giving any information.

Point 2.—The gross area of the Sholapur District is 2,906,378 acres, out of which 2,478,979 is returned as cultivable. The proportion of the latter protected by Government irrigation works is '33 per cent. and by wells 3·2 per cent. "Private or village works" do not exist, as far as I know, in any shape other than wells or embankments; the former have been taken into account and no statistics are available for the latter. The soil varies greatly: two broad divisions are the heavy black soil of the valleys and the light gray soil of the uplands. Rainfall averages 25 inches: the late rains are chiefly depended upon, rabi crops being the backbone of cultivation. Water is only used during the monsoon for garden crops: for ordinary crops it is used, if

available, when a prolonged break in the rains occurs. All crops are capable of irrigation, but with a good monsoon only such crops as are known as garden crops require it. Sugarcane and *makka* (maize) are the chief *bagayat* crops of the district as far as I have noticed. The number of waterings depends on the soil, method of cultivation and kind and quantity of manure used: I cannot give any precise figure. Distribution of water from canals is controlled by the Irrigation officers and their subordinates, who by personal inspection see that no one gets water from the canal unauthorizedly and that no waste occurs. A man pays so much per acre for any particular crop (there is a regular scale, in which sugarcane comes highest) and can take as much water for that crop as he wants. Irrigation revenue is realized in cash at the time of the land revenue instalments.

Point 3.—There is practically no cotton grown in the district, and the black soil of the valleys above alluded to differs from the black cotton soil of Brouch and Surat in its properties, though it somewhat resembles it in appearance. The black soil of Sholapur can be, and is as a matter of

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course, irrigated with success, whereas irrigation of cotton soil in Gujrat is, as far as my experience goes, a failure.

Point 4.—The completed tanks in my subdivision (Sholapur, Bārsi, Mādha and Karmāla Tālukas) are the Ekruk and Ashti tanks. I cannot give technical figures. These works cannot be entirely depended on in a season of drought, but if the early rains are heavy they are capable of saving lands under their influence from a failure of rabi crops owing to an early cessation of the monsoon. Works still uncompleted are the Pathri, Hotgi, Vadshivne and Manji tanks.

Point 5.—The Public Works Department is concerned with this: I know nothing about it.

Point 6.—District and village works are, as far as I know, unknown here. The only way I can think of in which such works might be useful would be if they took the form of impounding water in nalas during the monsoon so as to raise the level of the sub-soil water in the neighbourhood, thereby improving the supply of water in wells for drinking and irrigational purposes.

Point 7.—The total areas irrigated from wells (for the whole district) during recent years have been as under:—

Year.	Acres.
1895-1896 . . .	85,196
1896-1897 . . .	99,383
1897-1898 . . .	94,321
1898-1899 . . .	94,858
1899-1900 . . .	91,981
1900-1901 . . .	78,849

I imagine the falling off this year has been due to the decreased supply of water in the wells following on a succession of droughts. The number of new wells constructed during the last ten years has not yet been ascertained. Construction has been assisted to some extent by tagāi. I consider the advances as now made for this purpose are liberal enough. No inducements are required: it is the complexity of the system and the delay generally involved, as well as the fact that he hardly ever gets as much as he asks for, which put the rayat against tagāi in many cases. Wells in this District were seriously affected by the recent drought; in nearly all the supply greatly diminished and in many it ran dry altogether. Boring with a "jumping-bar" aided with blasting powder proved wonderfully successful in many cases, but failed in others. I cannot give numbers. Depth of water in wells varies immensely: in soils where there is no rock water is often found 15 feet below the surface, in rocky parts seldom less than 30, sometimes not even at a depth of 100 feet, below which borings are hardly ever made. An ordinary well for irrigation costs about Rs. 300. The area served varies with the size of the well and the nature of the cultivation. Six acres at a time might be an all-round average.

Point 8.—The undulating character of the District renders it absolutely free from water-logging.

Point 9.—Is Public Works Department matter as far as statistics go. All the incomplete works mentioned under point 4 ought to be completed as soon as possible, but Hotgi and Pathri are less urgent than the others named. The reason is the uncertain character of the rainfall in this District which is notorious. I have heard that some small (village) tanks in the Karmāla Taluka, constructed as famine works in the famine of 1876-77, have become practically useless owing to want of maintenance. I have not yet seen them, but will have my evidence on the point ready by the time the Commission comes to Sholapur.

Points 12, 13 and most of 14 are not in my province. No whole villages are protected by the irrigation schemes in this District, so the necessity for relief in a famine year is not anywhere entirely obviated by them.

II.

A—General.

1. The Solapur, Bārsi, Mādha and Karmāla Tālukas of the Sholapur District. I have held charge only since May last (six months) and have travelled in these talukas very little, but I have visited them all off and on. Consequently I cannot profess to know them at all intimately.

2. 25 inches is about the average fall for the year. I have not got the monthly figures.

3. (1) No.

(2) No.

(3) Yes, I think manure would fall short.

(4) Nearly all the culturable land is suited for irrigation.

(5) This difficulty has not occurred in the tanks now in use except in years of actual drought, i. e.—just when the water is most wanted.

(6) No.

(7) Not at all.

(8) No.

(9) The chief reason which militates against extension of large irrigation works in this District is, I believe (it is a technical matter), paucity of sites for tanks. Irrigation from wells is capable of almost indefinite extension.

4. Land is exempt until the expiry of the current revenue settlement, which remains in force for 30 years. Exemption is secured in practice by leaving things as they are. I cannot say what the case may be with tenants and their landlords: it would depend on the length of the lease. I consider the existing provisions sufficiently liberal: no one ever complains of the assessment or the water-rates.

5. Not very freely: the only hindrance, I think, is the unfamiliarity of the rayat with the system and the bother he is put to to get an advance which, if he gets it, is often too late or too small to be of much real use. Much can be done by systematizing enquiries instead of sending petitions received at any time, from pillar to post, as is often done. The Sub-Divisional Officer can easily put things on a more business like basis. But many difficulties are insuperable, i. e., the land in which the well is required is often mortgaged, and this always complicates the procedure and often proves a bar to the loan. Interest and instalments are liberal enough. Remission in cases where the attempt to obtain water fails should be (and I believe is) allowed to the extent of the money actually expended. No other concessions are, in my opinion, required: no rayat considers our present terms unreasonable.

6. No; irrigation is too sparse here for that.

[Questions 7 to 33 I cannot answer. I have had no experience of irrigation, canals or tanks previous to my arrival in Sholapur, and very little since.]

34. (1) About 15 feet in soft strata and 30 in rocky strata.

(2) Percolation as a rule or minute springs which cannot be distinguished from it.

The level always gets low in the hot weather, and water is liable to fail altogether when there is real drought.

I have not seen any cases here of water getting salt in the hot weather.

(3) Rs. 300.

(4) For ever, if kept in repair and free from inundation.

(5) By water bags (mot).

(6) Twenty acres.

(7) Six acres.

35. (1) Given a sufficiently large holding and enough live stock and manure, a man can in an ordinary year double-crop parts of his land, but not the whole, if he has a well. But this takes a lot out of the soil and means constant labour. Ordinarily not more than a quarter of the area commanded would be irrigated in any one year, and a double-crop once in four years would not do undue harm, given, as observed above, plenty of manure. In practice, however, not more than half the land irrigated would be sown with dry crops in the same year.

(2) In an ordinary year the irrigated crop is almost always of the more valuable kind, chiefly *makka* and sugarcane.

(3) I do not think a well is often used to increase the outturn in a good year. It is in years of scanty rainfall and of actual drought that a well is chiefly useful, as it is then that it makes the difference between poor or no crops and good crops, to say nothing of its powers of producing fodder. But of course anything like a full yield over the holding is impossible when well-water takes the place of rain; even were there a well in every field and water in plenty in every well, the labour necessary to irrigate the whole would never be available unless the existing stock of bullocks were multiplied over and over again. Thus wells can be and are a great palliative, but not a complete preventive, of famine due to failure of timely rain.

36. (1) I cannot.

(2) Total drought and perfect irrigation would mean a proportion of $\frac{2}{3}$ 1, i. e., infinity.

37. Government assessment is roughly Rs. 1-2-0 per acre for *bagayat*; 12 annas for *jirayat*. The rent of a field

is trippled or quadrupled by the existence of a well: per acre *bagayat* rent would work out to about Rs. 5, *jirayat* to about Rs. 1-8-0 or Rs. 2.

38. Water is generally to be found in the valleys where there is black or other deep soil, and cultivation abounds. Uncultivated uplands, or cultivated parts where muram is near the surface and solid rock a few feet below, are usually hopeless for boring purposes. Inasmuch as most cultivation is in the lower-lying lands answering to the first description, there is not, as a rule, difficulty in finding water by boring or digging in the fields. But village sites are often, indeed generally, on comparatively high rocky ground, and hence it is not infrequently hard to find water for domestic purposes near the place where it is most required.

(2) No.

A good deal was done last year in the way of boring and blasting in wells of which the supply had run dry, generally with success. But this was in the case of existing wells. I am not aware of any cases where trial borings were made or tools lent to individuals. I do not think trial borings would be of much use here, because, as I have said water can generally be got in the lowland fields, and in the high ground wells are seldom required except for drinking purposes, when it is best to bore the already existing wells.

39. I think that, with the consent of the occupant, Government might undertake the construction of wells in private holdings, charging nothing, but recouping themselves eventually by the increased *bagayat* assessment. But diffi-

culties would undoubtedly supervene, e.g., the alienation of parts of the land commanded by the well, when disputes as regards the rights of the parties over the well might follow. If, however, the well were made Government property in perpetuity, Government would always be in a position to direct who should have the use of it. I fear that at the best the complications which must ensue would go so far to annihilate the usefulness of the scheme, but it might be tried, especially in vatan lands or lands occupied on the new non-transferable tenure. Current repairs to such wells would have to be effected by Government, and this would no doubt be a heavy charge; but if experience showed that these expenses and the initial expenditure could not be recouped by the ordinary *bagayat* excess over the dry crop rates the former might legitimately be increased in such cases.

40. Yes: temporary wells, or *kelas*, as they are called are often dug in the beds of watercourses to provide water for drinking purposes and for watering cattle when other supplies are scarce. Water is also occasionally lifted from them by *mots* for irrigation. The water is usually to be got at a depth of three or four feet. Inasmuch as a fairly large watercourse is a *sine qua non*, such an expedient can only be resorted to in very limited areas, and a *kela* only lasts for one dry season. I do not think much encouragement is needed: a *kela* costs practically nothing. But as it is, sums have been given in many villages from Government and Local Fund grants for the construction of such temporary supplies.

Mr. H. L. Painter.

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1. Q. (The President).—You begin your note by saying you have only nine months' experience of the Deccan, and that you were previously in Gujarat. What district of Gujarat were you in?—I was one year in Ahmadabad and 3½ years in Broach, after that I was Personal Assistant to the Commissioner and he sent me all over the famine districts.

2. Q. You say in the first page of your memorandum "the black soil of Sholapur can be, and is, as a matter of course, irrigated with success, whereas irrigation of cotton soil in Guzerat is, as far as my experience goes, a failure." Have you seen them irrigating the black soil freely here?—Yes.

3. Q. Has that been on account of the extreme drought, do you think in a normal year they would have irrigated it?—It is black soil which would take water in ordinary years, it is not black cotton soil, that is very different.

4. Q. Supposing any large scheme for irrigation is hit upon for Sholapur, could one count in normal years upon the water being freely taken in black soil?—I think so, certainly.

5. Q. It is quite different from the Broach soil?—Yes, quite.

6. Q. Alluding to advances you say "I consider the advances as now made for this purpose are liberal enough. No inducements are required; it is the complexity of the system and the delay generally involved, as well as the fact that he hardly ever gets as much as he asks for which put the *rayat* against *tagai* in many cases." It is an extremely important thing that a man should take advantage of the system with a view to the extension of the well irrigation of the country; do you suggest any means of furthering it?—If we could get things done a little more promptly than they are now, it would help.

7. Q. How long does it take a man to get an advance from the time he makes an application?—It depends upon the system which is established in the sub-division; if you go in for a system of written petitions which have to go for report to the village officers and then come back, it may take six months, but if it is systematized, I think, I could guarantee to do it in a month.

8. Q. Is it the Mamlatdar whom one must rely upon for information about it?—No, it is the village officers.

9. Q. Can you see any way of simplifying matters, simplifying so as to make them prompt and easier?—I think paper writing should be as far as possible abolished. In the *taluka* for every payment made no less than nine different documents have to be executed, that takes time.

10. Q. Are these documents simply bearing upon the man's credit security, *bona fides*, etc.?—Yes, and some are simply account matters, taking signatures, etc.

11. Q. You think that kind of thing is over-done?—Yes, very much so.

12. Q. Is that due to undue caution on the part of the establishment concerned or is it simply the insistence of red tape?—These nine documents are entirely red tape.

13. Q. You say that the *rayat* rarely gets as much as he asks for; what prevents him getting what he asks for?—Generally I think the impossibility of knowing exactly how much the work will cost and a certain amount of suspicion as to the genuineness of the application.

14. Q. (Mr. Ibbetson).—What does "genuineness" mean?—A man will ask for Rs. 50 to deepen a well, he may deepen it 2 or 3 feet, you don't know if he misappropriates half the sum received or not.

15. Q. (The President).—Is it possible to control that?—I think so, by visiting the place and making the man point out exactly what he wants to do and then having an estimate made, but you want a certain amount of skilled assistance for that.

16. Q. This visiting and making enquires is that asking from the Local Government officers more than they have time to do?—No, not for wells, but for seed and cattle would be a different matter.

17. Q. If a man asks for Rs. 500 to make a well and you have reason to believe that that is the cost of the well, would you give him the whole amount?—Yes, I would give it to him.

18. Q. Mr. Macnochie said just now that in order to make the money go as far as possible it might be desirable to give only half the amount asked for?—I don't think it has been necessary where I have been. We have always had as much as we wanted.

19. Q. Have you yourself seen much of this well deepening by blasting?—No, not much.

20. Q. You say on page 3 "all the incomplete works mentioned under point 4 ought to be completed as soon as possible, but Hotgi and Pathri are less urgent than the others named." Why do you say preference should be given to the others?—Because Sholapur and Barsi *talukas* are much less liable than the others to famine.

21. Q. You say "I have heard that some small village tanks in the Karmala *taluka* constructed as famine works in the famine of 1876-77 have become practically useless owing to want of maintenance." Coming from Guzerat here I suppose you see a great difference in the number of village tanks?—Yes, in Guzerat every village has a tank, here it is quite the exception.

22. Q. Would you say that the nature of the country, the general amount of slope, etc., is sufficient to account for that here, is it possible to make tanks here as easily as in Guzerat?—I think almost easier, I don't know why they have not got them; in Guzerat you have to dig your tank out of the flat plain, here you only require to make a bund.

23. Q. (Mr. Ibbetson).—Do they grow much rice here?—No, very little indeed.

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24. Q. (*The President*).—Have you seen these large tanks in the district; do the people seem to appreciate them?—Yes, there is only one in my sub-division—the Ekruk, the Ashti is on the border, I don't know much about it, as the canals are in the other charge.

25. Q. You say on page 3 “the chief reason which militates against extension of large irrigation works in this District is, I believe, (it is a technical matter) paucity of sites for tanks.” You don't apply that to village tanks?—No, large tanks.

26. Q. To go back to your former place, Gujarat, if in the District of Broach, for instance, there had been irrigation from the Tapti in the last few years, do you think the people would have availed themselves of it?—Yes, I think they would have tried it, but I doubt if it would have done very much good.

27. Q. Famine is very rare in Surat and Broach, what measures do you think would be best to employ for protecting them in case of a famine?—I don't think you can protect Broach.

28. Q. Looking further 'up at Kaira, Ahmadabad and the Panch Mahals, there irrigation could be used to any extent?—Yes, in the light soils.

29. Q. Could the Sabarmati and Mahi be drawn upon?—I don't think so, I don't know much of these districts, I was there a very short time.

30. Q. (*Mr. Higham*).—You say that irrigation from wells is capable of indefinite extension in this district, is that in all parts of the district?—Yes.

31. Q. In regard to the question of advances for them, I see you also say that one reason why they don't apply is, not only is there delay but they don't get as much money as they want; do you mean that they don't get as much money as is necessary to make wells?—Yes, in some cases.

32. Q. Supposing it was decided to take some heroic measures for encouraging the construction of wells in any taluka, do you think it would be facilitated by putting a special officer on the work, who would have authority to make *takavi* advances within a certain time; he would be given an establishment for making trial borings and that sort of thing, and he would examine on the spot all applications made and make advances by instalment as work was carried out?—Yes, I think it would be good in a way, but it would be availed of to a very small extent, people ask more for money to deepen wells than to make new ones.

33. Q. That would a part of the general scheme; the officer employed would in time become an expert and pass on to another taluka?—I think it would be a good thing.

34. Q. You don't think it would be lead to any increase in the number of wells?—I don't think it would make very much difference. I don't think it would be worth while, on the whole to make special efforts.

35. Q. You would avoid the delays of which you speak and you ensure the money being spent for the purpose for which it was required, and get a good idea of the money actually required for the purpose?—I think it is only a question of local management.

36. Q. Local management can be availed of, but in practice it is not possible, except where you have an officer who takes a special interest in it; supposing a revenue officer, eminently fitted for the work was put on, do you think it would be a good plan?—Yes, I think so.

37. Q. Do you think it would be sufficient to trust to local establishments?—I think they could deal with it.

38. Q. Of course the man would be working under the District Officer, not independently?—It would be worth trying, I think.

39. Q. (*Mr. Ibbetson*).—You say in your memorandum “land is exempt until the expiry of the current revenue settlement which remains in force for 30 years.” Is there any exemption beyond that when the settlement is revised?—I understand that if a well is dug in *jarait* land, when the new settlement comes round, it is assessed as *bagait*.

40. Q. You say also “remission in cases where the attempt to obtain water fails should be, and I believe, is allowed.” You are not sure about that?—I have never known a case.

41. Q. (*Mr. Rajaratna Mdlr.*).—You said that nine documents have to be drawn up in connection with the grant of *takavi*; have you thought which of these could be dispensed with?—I think all could be dispensed with except the receipt for the money. I think the bonds could be done away with.

42. Q. It is that which gives you authority to recover the money?—I believe we have authority without the bonds. We can recover arrears of *takavi* like arrears of land revenue.

43. Q. (*Mr. Ibbetson*).—There are no bonds taken in Northern India, the land is hypothecated by means of a mortgage. Do you make a man execute a formal mortgage?—Yes in 99 cases out of 100 it is done; you can take personal security.

44. Q. (*Mr. Rajaratna Mdlr.*).—It is a question whether in the absence of that bond Government could recover on land that was already mortgaged?—If we find that the land has been mortgaged, we do not accept it as security.

45. Q. (*Mr. Ibbetson*).—Are you quite sure about that?—In practice that is the case.

46. Q. Although the law provides that land revenue should take precedence of that pre-existing mortgage?—I am sure it is the practice.

47. Q. (*Mr. Rajaratna Mdlr.*).—Does not the law give the *rayat* exemption on account of improvements?—I don't think so.

48. Q. In paragraph 39 you say “Government might undertake the construction of wells in private holdings charging nothing but recouping themselves eventually by the increased *bagait* assessment.” At what rate would you fix the *bagait* assessment?—It would be fixed according to the ordinary principles, without reference to the ownership of the well or the cost of the well.

49. Q. That enhanced assessment covers a certain proportion of the interest; Government has to borrow money at 3½ per cent., would you adopt that as the limit?—I would ignore everything with reference to the building of the well by Government.

50. Q. In the same paragraph you say “but difficulties would undoubtedly supervene, e.g. the alienation of parts of the land commanded by a well?”—I meant to say that the owner of the well itself might refuse to allow other people to use it, although it was originally intended that the land should be covered by the well.

51. Q. That is a matter for private settlement; they could always establish their rights; how would the difficulty arise?—It would mean complications I think; for two or three years nobody would be able to use the well.

52. Q. Government could recover the money I suppose?—The question I was thinking of was that the person to whom it was alienated might not be able to get the use of the well.

53. Q. That is a matter which concerns him and not the Government?—Yes.

WITNESS No. 65.—The Reverend Mr. H. GATES, Sholapur.

Mr. H.
Gates.

4 Jan. 02.

1. Q. (*The President*).—Have you been long resident at Sholapur?—About 25 years.

2. Q. You know the district well and have seen it through its times of famine and prosperity. You are resident in Sholapur itself?—Yes.

3. Q. After the experience of these last 25 years, what do you consider would be the best and most reasonable measure for Government to take, in order to make the physical and moral distress less on the recurrence of a famine?—I have thought of this question considerably and of ways of getting water; there seem to me to be only two ways of getting it: first by raising it from the ground, and, secondly,

by taking surface water. I think that an improvement is possible in both these ways. I am not confident that much can be done in the way of Artesian wells; the strata of rocks are too level for success; there must be a variation in the under-lying impervious strata; there are some variations in places where water can be more easily obtained than in others, and I think it would be well to find out where these places are so as to help the people to get water. I have not had much experience in well boring, although an experiment was tried in Sholapur, but it seems to me that if well boring machinery were introduced by Government, trial borings might be made in certain places, so that the people could find out where they would be likely to find water; if, for instance, such machinery were put in the

bands of the Collector, it could be sent to different sections of the Collectorate and trial borings made, and I think it would pay. As for surface water, every year oceans of it goes away into the Sina and Bhima rivers. India has the largest rainfall of any country in the world and suffers most from famine; why cannot we catch the water in some way? In Southern India they store water in tanks, there the surface of the ground is more level than it is here, it is easier to take water out of rivers because the river beds are shallow; here it can be managed if dams are put across the Sina and Bhima river beds and the water turned off and stored in large tanks. I think the water could be used for irrigation, or, if not, it would raise the general water-level of the soil. Another scheme I have dreamed of for years is to put large dams across the Sahyadri or Western range of mountains, put large dams in the valleys—there is a rainfall of 100 to 400 inches and it is of no use to anybody—the land is higher than most of the Deccan, and slopes to the east. Why cannot large tanks be made there? I am not an Engineer, but it seems to me something of that kind might answer. In Mahableshwar, we have had 400 inches of rain, and I have seen places where a dam could be put and where an immense amount of water could be stored. There may be difficulties that I don't see. One Engineer told me that this water would not be very useful near the dams, because there is a pretty good rainfall every year, but I don't think that is a sufficient objection.

4. Q. Do you think that in a year of normal rainfall in this district the rayat would avail himself of canal water or water from the tanks?—I think he would.

5. Q. Would he take it for his staple dry crops?—He would take it for the crops he thought would pay best—*juari* or some other.

6. Q. There is no question, do you think, that the water would be disposed of?—I think not.

7. Q. Elsewhere, where there is heavy black cotton soil, we have been assured that the rayat will only under great extremity take water; the works you have suggested would fall on the tax-payer, and it is highly important that some water-rate be paid, not only once in a dozen years but every year?—From all I know of the people, I think they would be glad to take the water.

8. Q. (*Mr. Ibbetson*).—They don't take water from existing tanks in ordinary years at present. that is one of the great difficulties here, why is that?—Government can answer that question better than I can.

9. Q. (*The President*).—Mr. Beale. would you say that the evidence is conclusive that tank water is not availed of?

(*Mr. Beale*).—I think so.

10. Q. (*Mr. Ibbetson*).—Do you still think that water brought at this enormous cost would, in ordinary years, be used when the water that is there is not used? The people seem anxious to take the water.

11. Q. Do they ever give reasons for not using the water that has been provided already at considerable cost?—I don't remember hearing any reasons.

12. Q. You didn't know the fact perhaps?—No.

13. Q. (*The President*).—I suppose the fact is that in a normal year dry crops require very little more water than the heavens give?—Yes, but there are lands above the black soil which might require water.

14. Q. Take the Ekruk tank, do you think it commands any lands of that description?—Yes, black soil is sometimes found on high levels and sometimes on low levels, and between them you will find red soil or *moorum* soil, which requires more water than black soil, you can raise anything on that, if you have plenty of water.

15. Q. From your intimate knowledge of the people, do you find that they appreciate the system of *takavi* and are glad to avail themselves of it?—I think so.

16. Q. Do you hear complaints of the formality to be gone through and of money sticking in the fingers of those it passes through?—Yes, I hear frequent complaints, the Patel and other underlings require their fee.

17. Q. Do the people go more readily to Government than to the sowcar?—I think they do.

18. Q. You have suggested that the Collector might have boring machinery for testing for sites for wells, have you any other suggestions to make which would accelerate the increase in the number of wells?—I don't think I have.

19. Q. Do you think the amount of interest—it is 5 per cent. in this presidency—deters them?—I don't think that is too high. I think generally people would rather go to Government and deal with Government than with the sowcars, because the sowcars would try to get the fields into their own hands, they can trust the Government better than their own men.

20. Q. We have had complaints made of the rigidity of the Government payments; it is said they have to be made whatever the season is like, and that the sowcar is more or less pliable; what is your opinion?—I have found that these people always have something to complain of, any way.

21. Q. You don't think they have reasonable grounds for complaint as regards that?—I have not that impression.

WITNESS NO. 66.—MR. GANESH PANDURANG THAKAR, B.A., District Deputy Collector, Sholapur.

Answers to printed questions.

2. In my subdivision the areas are as follows:—

Name of Taluka.	Gross area.		Culturable area.	
	A.	g.	A.	g.
Pandharpur	306,039	30½	228,872	1½
Sangola	418,333	20½	364,368	3½
Malsiras	3,67,552	0	217,421	31½
TOTAL	1,091,925	10½	810,662	26½

Protected areas.

Name of Taluka.	PROTECTED BY					TOTAL.	
	GOVERNMENT IRRIGATION WORKS.		PRIVATE OR VILLAGE WORKS.	WELLS.			
	Highest 1899-1900.	Lowest 1895-96.	...	Highest 1899-1900.	Lowest.	Highest	Lowest.
Pandharpur.	6,518	2,291	...	8,247	6,827	14,766	9,118
Sangola	3,064	800	...	15,317	...	18,881	...
Malsiras . . . . .	...	...	...	14,093	7,515	14,093	7,515

Mr. H. Gates.

4 Jan. 02.

Mr. Thakar.

4 Jan. 02.

Mr.
Thakar.

4 Jan. 02.

These figures are taken from Mamlatdar's records and are not very correct.

The irrigation figures for Mhaswad Tank are 13,656 acres in 1899-1900 and 3,481 acres in 1895-96 for Pandharpur and Sangola together.

In Pandharpur and Malsiras the land on the banks of the Bheema is very rich alluvial land, but as you go farther towards west it becomes ordinary black soil and then gradually submerges into light muram soil fit for kharif crops only. In Sangola, though the taluka is traversed by the river Man, there are no alluvial deposits on its banks and almost the whole taluka is light muram land of a very inferior quality. This kind of land is however well suited for an irrigation work to be profitable.

If the rainfall is sufficient and seasonable no artificial irrigation would be necessary for ordinary crops. In case of failure of rainfall nearly $\frac{1}{10}$ ths would require artificial irrigation. Even in the year of normal rainfall artificial irrigation would increase the productive capacity to a small extent.

Average rainfall is—

	Inches.	Cents.
Pandharpur	25	33*
Sangola	23	35
Malsiras	21	82

If the rainfall is normal, there is no demand for ordinary crops in good soil, but in light soil there is always a demand for irrigation water even for ordinary crops, because the normal rainfall is not sufficient to raise as good crops as can be raised by the irrigation water. For superior crops there will always be a demand for such water.

Name of crop.	Number of waterings required.	At what times of the year.
Ground-nut	15 to 20	June to January.
Sweet potato	20 to 25	For 8 months at any time of the year.
Chillies	20 to 25	June to December.
Sugarcane	50 to 60	Throughout the year.
Hoondi	8 to 10	Any time, but usually between March and July.
Khapali wheat	8 to 10	November to February.
Maize	8 to 10	Any time, but usually between March and July and June and September.
Vegetables	20 to 25	At all times according to season.

Distribution of canal water is controlled in the following manner.

Some specific period of time, say, a week or ten days, is assigned to each group of holdings. The Patkaris or Karkuna appointed for the purpose allow the quantity required for the group to run into the branch channel assigned to the group, and the owners of holdings take the required quantity from the channel. Sometimes the owners of upper holdings take larger quantities and those down below get less. But usually care is taken that equal distribution is made.

Every year the crops enjoying irrigation are measured and the assessment calculated on them according to the sanctioned rates. The revenue is recovered in cash by the Revenue Department.

3. There are no such tanks; but from the experience of small dams thrown across small streams to collect water for crops requiring more water it would appear that tanks constructed in black soil will hold water.

When the land irrigated is a black soil there is some demand, but very slight, for water even during seasons of normal rainfall for crops requiring regular and frequent

waterings; but certainly not so much as in the case of prolonged drought.

In such soil the irrigated area does show a falling off in years of fair rainfall.

The revenue is more precarious.

No. Not much desire if the rainfall be normal.

No.

4. The information required in this question would be best given by the Irrigation Department.

There are only two canals in my charge, Mhaswad and Ashti.

The estimated annual irrigating capacity of the former is, I think, 106,000 acres but there being some defects at the headwork and in the line, the present actual capacity is, I think, only 27,000 acres. I have no information about the other tank.

To a considerable extent, especially in the case of Mhaswad Tank, its catchment area being very large.

My information is that there is one good site for a tank on the river Bheema near Shankargaon on the river Man near Nazare and on the river Nira near Kurbavi. There are also good sites on the smaller streams, one near Sanand, one near Nimgaon, one near Gardi, and one near Waki.

I beg to suggest the following sources of irrigation :—

(a) The leakage water of Mhaswad Canal runs through some streams in large quantities. Small masonry dams may be thrown on them at convenient sites, and the running water utilized for irrigation. The cost will not be more than 1,000 to 1,500 rupees in each case, and the works can be entrusted to the Local Boards.

(b) At convenient sites small storage tanks may be constructed and they may be filled by feeder canals by the water of the Man River which escapes through the waste weir during monsoon. These small tanks will be able to irrigate, say, 200 to 500 acres in each case.

I beg here to suggest that land-holders should be encouraged to make their fields level and to throw small dams around them as in the Konkou, so as to retain and turn to account every drop of water falling from the skies. At present the lands are sloping and rough that much of the water of a heavy shower—rain usually falls in such shower in this part—runs over the ground and is wasted.

5. No provincial works in my charge.

6. No such works in my charge.

There are a few *kachcha bandharas* or temporary water courses carrying a small quantity of water to lands. The holders enjoying the irrigation throw an earthen dam every year and carry water. If the water fails remissions are granted. There is no responsibility on Government for their up-keep. These may be made into masonry *bandharas* and new ones constructed as suggested under reply.

4. These will be very useful as protective works. Their value concerning village water-supply will not be much. Small tanks dependent on rainfall constructed as village works will not be of much use for irrigation. They are not wanted for men or cattle as the wants of the latter are otherwise satisfied.

7. Total area irrigated by well :—

Taluka.	In ordinary years.	In years of drought.
	As.	As.
Pandharpur	7,000	9,500
Sangola	14,000	16,000
Malsiras	11,000	14,000

NOTE.—These are rough figures; authentic information as to the total number of wells and the area under their command has not yet been received.

The extent of irrigation depends upon the quantity of water available in wells.

Number of wells constructed annually during the last ten years :—

Year.	Pandharpur.	Sangola.	Malsiras.
1891-92	Not yet received.	Details not received.
1892-93 . .	4		
1893-94 . .	5		
1894-95 . .	3		
1895-96 . .	...	
1896-97 . .	120		
1897-98 . .	77		
1898-99 . .	7		
1899-1900 . .	15		
1900-01 . .	29		
	*260	†102	‡707

* All by tagai ; 47 more by private capital.

† 102 by tagai during the last ten years. Number constructed by private capital not yet known.

‡ Half by tagai and half by private capital.

It is desirable to encourage well construction by larger advances.

No concessions other than those given in the rules were allowed except in the last two famine years, when partial exemption from interest and postponement of repayment were granted. Almost all the wells were affected more or less by the drought of 1899 to 1901, but many of them contained some water which was sufficient to raise ordinary food crops instead of richer crops.

Yes. Many were deepened and the deepening was generally successful in obtaining more water.

Number failed or abandoned.

Information not available. I think about 15 to 25 per cent. of the whole number.

30 to 40 feet below surface.

Cost from 500 to 700 rupees.

Area served—about 10 acres for middle class ; 2 for superior and 15 for ordinary crop.

8. There are no parts to my knowledge in which lands or crops are injured by water-logging. No drainage work required any where.

There is however a popular complainant that the canal water injuriously affects richer lands and makes them unproductive after a continuous irrigation for 10 or 15 years. According to their ideas the land-holders explain the phenomenon by saying that the canal water being stagnant is colder than, and therefore not so healthy to crops as, well water. I am not satisfied with this explanation. I do not understand why stagnant water should deprive the land of its productive capacity more rapidly or completely than well water. What I think the reason of canal water impairing the productive capacity to be is that it is given to land indiscriminately in much larger quantities than the well water, being less expensive and more abundant. The lands soak it to a great depth where the moisture remains undried, being beyond the reach of the surface

sun-heat. It is said that the saline efflorescence begins low down underground and gradually rises up to the surface. This evil result can, I think, be avoided if a smaller quantity is allowed than at present either by reducing the quantity given at each time or by making the waterings less frequent.

General deficiency of manure is another cause. Manure is very costly and scarce in these parts and is consequently not given to lands in such large quantities as are necessary to replenish their productive capacity which is being rapidly deteriorated by the continuous cultivation of superior crops which being more profitable the land-holders are induced to make without intermission or variation. If a cheap and locally procurable artificial manure can be suggested this defect can be remedied to a great extent.

9. In the last two years' famine two irrigation tanks, the metalling of three roads, and the repair of one village tank were undertaken. They are completed except the two new irrigation works. It seems most desirable to bring about their early completion as they will be of much use in generally improving the condition of the surrounding country apart from their great value as protective works in times of drought. No village tanks constructed. No experience is yet gained about the Karkamp Tank ; but there is much room to hope that it will remove the present great scarcity of water felt at that place, and fill with water all the surrounding irrigation wells which had become almost dry during the last two years.

14. Protective value of the two irrigation works in the famine since 1897 has been considerable.

Areas irrigated are as follows :—

Year.	Mhaswad Canal.	Ashti Canal.
	As.	Not obtained.
1895-96	3,481	
1896-97	7,547	
1897-98	6,133	
1898-99	6,101	
1899-00	13,656	
1900-01	5,842	

It was the failure of the water, not the unwillingness of the people, that has so much curtailed the irrigation area in 1900-01.

Some persons went on relief work and some were also on dole in the villages protected by irrigation works. But the proportion was considerably small. Had the works been not in operation about 10 to 15 per cent. more of the village population would have sought for relief.

Comparing an irrigation work with wells let us take Mhaswad Tank. The initial cost is about 20 lakhs. A well ordinarily costs Rs. 500, so there will be about 4,000 wells by spending 20 lakhs. About 25 per cent. will fail or have scanty water. The remaining 3,000 will irrigate about 30,000 acres of ordinary crops, whereas the capacity of the Mhaswad Tank is estimated at 106,000 acres with a more profuse supply of water than well water ; besides, no cost of lift as in the case of wells. In this respect irrigation works are more advantageous : on the other hand, the land becomes poorer by saline efflorescence, which is never the case in well-irrigation.

1. Q. (The President.)—How long have you been in this district ?—Two years.

2. Q. Where were you before ?—In Kolaba.

3. Q. There are three talukas in your charge ?—Yes ; Pandharpur, Sangola, and Malsiras.

4. Q. The first-named is under the Mhaswad tank ?—Yes, and also a part of Sangola.

5. Q. The increase in irrigation under this tank is due to the drought. When the drought ceases I suppose the figures will go back to those of normal years ?—No, the people see the advantage of irrigating rice and other supe-

rior crops, such as ground-nuts and sweet potatoes and they are not likely now to go back to the old state of things.

6. Q. Is the Mhaswad tank capable of further extension for irrigation ?—I am not able to offer an opinion as I am not an Engineer, but have heard that if certain repairs to the tank were carried out its capacity could be increased.

7. Q. Is there much water in the Bhima just now ?—No, it may have 9 inches or a foot.

8. Q. Is there a large amount of irrigation direct from its banks ?—No.

9. Q. Neither by *mot* nor well ?—I don't think the Bhima is suited for *mot* irrigation on the banks.

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10. Q. Why?—The banks are very steep and *not* irrigation would be too expensive.

11. Q. Are they too high?—Yes; and besides it is a very silty soil, it is not suited for making wells for taking up the water. The Mand river is much more suitable.

12. Q. (Mr. Ibbetson).—Is there much water in the Mand river?—Yes, under-soil water; wherever it is possible, they sink wells.

13. Q. As to irrigation under the Mhasvad tank have cultivators to apply before taking water?—Yes.

14. Q. Have they to apply for every crop?—Yes.

15. Q. To whom is the application made?—Either to the Subordinate Engineering officer or to the Executive Engineer; ultimately the applications have to go for sanction to the Executive Engineer.

16. Q. How long does it take for a man who makes an application to receive a reply?—About 5 to 30 days, but the applicant generally sends his application in time to allow for that.

17. Q. Because he knows the difficulties?—Yes.

18. Q. Do you think there would be any extension of irrigation if the application system were abolished?—What good will that do?

19. Q. The rayat would get water earlier?—I have not studied that view of the question, but I don't think that would do much good, because the people in our district are rather dishonest and they might take more water than they are entitled to.

20. Q. But they will have to pay for it?—Yes, that is true; but there would be quarrels as every man would want to have his own way.

21. Q. That is the system pursued very largely in other parts of India?—Yes, as far as I know. But here application is only a formality. The application goes to the Executive Engineer and he sanctions it.

22. Q. Is there any good in it?—Yes, one thing is that the village officers are made to sign the application as collateral securities for the due payment of the water tax.

23. Q. That is quite usual?—Yes.

24. Q. Do the people take water year after year?—Yes sometimes one cultivator sometimes another, but they all take water.

25. Q. You spoke just now of security being taken?—It is a formal thing; the village officers are required to sign the application. The cultivator pays the water rate generally.

26. Q. You say, "every year the crops are measured. The revenue is recovered in cash by the Revenue Department." Is a large amount not recovered?—I don't think; most of the money is recovered. I don't think there would be any serious harm in abolishing the system of application in the case of high class crops.

27. Q. Do you consider that the black soil of the district is generally favourable for irrigation?—No, only red soil is irrigated.

28. Q. In normal years would they take irrigation in any other soil?—Yes, black soil, which is not very deep with a substratum of *muram* will take water.

29. Q. What sort of soil is that irrigated under the Mhasvad tank?—It is *muram*; almost the whole of it; a very little is rich black soil.

30. Q. I gather that the people who have had irrigation throughout the district these last few years go on taking irrigation?—Yes.

31. Q. Would that hold good in black soil?—Yes, for some crops.

32. Q. You say in page 3, my information is that there is one good site for a tank on the river Bhima—and on the river Neera. There are also good sites on the smaller streams. Do you know any of these sites? Have they been examined by the Engineer?—I think they were examined some 20 years ago when the site for the Ekruk tank was selected; some 2 or 3 other sites were also examined.

33. Q. And objected to?—Yes, I don't know what the reason was.

34. Q. You say at the bottom of page 3, "I beg here to suggest that land-holders should be encouraged to make their fields level and to throw small dams around them as in the Konkan." How are they encouraged in the Konkan? Do they get *takavi*?—They do it voluntarily because rice crops cannot be successfully raised unless there are dams and the soil levelled.

35. Q. How are you going to put pressure upon them here?—I should like to put pressure on them in their own interests.

36. Q. What pressure? Refusal of water until the work is done?—I refer not only to irrigated lands but to all lands. Famine labour might be employed for the purpose and something might be recovered from the owners.

37. Q. Have you experience of famine labour?—Yes.

38. Q. Do you think that it would be a good form of famine labour?—Yes, if the dam work is properly supervised; my idea is that it would stop the present waste of water. I know of some people who have voluntarily put up small dams and they got good crops even in famine times.

39. Q. What sort of encouragement would you give for well irrigation?—With regard to the distribution of *takavi*, I think we must have a separate agency, a regular establishment for the payment of loans.

40. Q. Do you think the present establishment is too busy?—Yes; a mamladar of lowest grade or a head karkun of the highest grade would do.

41. Q. Do you mean one for each district?—One for each taluka or two talukas at the most.

42. Q. It would not go on always?—Yes, it would.

43. Q. *Takavi* advances would not be required in each taluka year after year?—For well improvement and well construction there would always be demand for some years. That, of course, would depend on the circumstances. My idea is that a separate officer must be appointed for that work. He would be part of the Revenue establishment.

44. Q. Under your orders for the time being?—Yes. He will have to make enquiries. The Record of Rights will simplify matters; there will not be so much difficulty in ascertaining the value of the security.

45. Q. Do you think the people will go on making wells?—Yes. In some parts the well-bearing capacity of the land has been exhausted, but where there is still scope the people will make wells.

46. Q. What is the case in regard to those parts where the well-bearing capacity has been exhausted?—There, you will find very few places now at which water can be tapped at reasonable depth or at a reasonable cost. My idea is that water can be tapped in the valleys and lower grounds only; as you go up, the difficulty and expense of getting water are enormously increased.

47. Q.—Some of the valleys are now fully occupied by wells?—Yes. There is uncertainty about tapping water higher up; that is a great obstacle.

48. Q. (President).—Supposing Government were to say, spend what you like in *takavi*, how much would be the increase in the area irrigated by wells?—My estimate is that it would be almost 5 times the present area.

49. Q. The present area watered by wells is about 15,000 acres?—Yes, in each of Sangola and Malsiras talukas and about 10,000 in Pandharpur.

50. Q. Do you think it could be increased to five times that amount?—Yes, that is the maximum.

51. Q. (Mr. Ibbetson).—Fifteen thousand acres for the whole district?—No, for one taluka (Malsiras) only.

52. Q. (The President).—What proportion of land generally can be watered by wells?—I cannot give the percentage.

53. Q. Do you think that in Sangola and Pandharpur the area can be increased five times?—In Sangola taluka the increase would be about the same. In Pandharpur probably less than that.

54. Q. (Mr. Ibbetson).—There you do not think the increase would be five times for the whole district?—No.

55. Q. (The President).—In these two talukas 24,000 acres could be irrigated?—Yes, out of a total area of 700,000.

56. Q. The cultivated area of the two talukas is only 580,000?—Yes.

57. Q. You could irrigate $\frac{1}{4}$ th of the culturable area?—No, about $\frac{1}{5}$ th.

58. Q. Do you think in Pandharpur it would be less?—Yes.

59. Q. Do you know the other parts of the district?—No; I was speaking about the uncertainty of finding water. The people do not know where water is to be found and so sometimes the *takavi* money is spent and there is no well. It would be a great thing if Government were to remit the amount altogether in such cases.

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60. Q. If water is not found?—Yes, that would be hailed with great joy by the people.

61. Q. You do not think that a man who got *takavi* would say, "I cannot find water" and spend the money on another object?—No. Government would not lose anything. Boring was tried in the last famine, but not to such an extent as ought to have been done. Government should in every case, send their own officers to select the site, and if good water is found all the cultivators would readily make wells.

62. Q. You say in paragraph 7, "it is desirable to encourage well construction by larger advances." Do you mean by giving a larger proportion to a man who asks for it or by Government giving enough for the district?—The cultivator in our district gets as much as he wants, but if we gave them larger sums of money at the risk of some loss well construction would be encouraged very much. I don't complain that sufficient sums are not allotted for the district; we get the money, but there is not much enterprise among the people.

63. Q. Do you think much would be done if Government reduced the rate of interest?—I don't think so. The people don't desire anything in that direction; they are quite satisfied with the rate.

64. Q. Are they content with the number of years within which they have to pay back the sum?—I think that the period should be increased to a certain extent.

65. Q. How much?—To 30 years; it may be made concurrent with the Survey-settlement period.

66. Q. That may be only five years?—If *takavi* is made a part of the assessment that would be, I think, a good plan.

67. Q. (Mr. Higham)—Do you know whether a good many small village tanks were constructed in your charge in the famine of 1877-78?—I don't know. I was not here at that time, but from what I see I do not think that many were made.

68. Q. We have it in evidence that a great many were constructed but are now out of use?—Unless the statistics are collected I cannot say.

69. Q. You say that a very small proportion of people went on relief works from the villages that are protected by irrigation. What was the general proportion that went on to relief in other villages?—From 25 per cent. to 33 per cent.

70. Q. For how long?—Almost the whole year.

71. Q. Which year are you speaking of?—Of 1900.

72. Q. Where the villages were protected by canals, some of the villagers also went on to relief?—Yes, in some villages some people did, in some they did not go. Where they did go the percentage was, I think, 5 per cent. to 10 or 11 per cent.

73. Q. Some of them did not go at all?—No; even in the number receiving doles there was a marked difference; the people receiving doles in irrigated villages were very few.

74. Q. In the villages in which relief was applied for what proportion of the culturable area protected by irrigation, was irrigated?—I think 20 per cent.; I am not at all sure, but it would be about 20 per cent.

75. Q. Where one-fifth of the area was protected people did not go on relief works?—No, that is my idea.

76. Q. I suppose in some of these villages a great deal more than 20 per cent. is protected?—Yes.

77. Q. I don't think they irrigate more than 25 per cent. of the culturable area in ordinary years?—They use water for high-class crops and not for *juari* and *bajri* if there is a good rainfall.

78. Q. Of higher crops they only irrigate a small proportion?—Yes.

79. Q. (The President)—Do they irrigate sugarcane?—No, only ground-nuts and sweet potatoes, which are middle class crops—not very high, and not very low.

80. Q. Is no sugarcane grown?—Yes, there is. In my charge there is a small area under sugarcane; it requires a very large quantity of water.

81. Q. (Mr. Higham)—In dry years, were there any villages in which half the culturable area was irrigated?—Unless I see the figures I cannot answer the question.

82. Q. Are any statistics kept?—Probably some might be found in the Agricultural Inspector's office.

83. Q. You say the Mhasvad Tank will irrigate 106,000 acres; where did you get these figures from?—From the

statistical atlas of the Bombay Presidency that was prepared sometime ago.

84. Q. They never irrigate anything like 106,000?—No; practically only 12,000 or 13,000.

85. Q. You irrigated 13,000 in 1899?—Yes.

86. Q. That is the most that has ever been done?—Yes; not more than that.

87. Q. The average is about 6,500?—Yes; my impression is that the capacity could be increased if some improvements were carried out.

88. Q. Do you suppose that if something is done to improve it will irrigate 106,000?—No; not more than 27,000; 106,000 acres is only the Engineer's estimate.

89. Q. That is four or five times more than you irrigate at present?—No, two times.

90. Q. As matters stand at present that does not compare at all favourably with wells?—If the full capacity could be got then I think 4,000 wells would not give as much water.

91. Q. (Mr. Bajaratna Mdlr.)—How many applications for *takavi* did you receive in your Division during the last two famines?—More than 1,000.

92. Q. In ordinary years how many do you receive?—About 150 or 50 for each taluka.

93. Q. Don't you think that the existing staff should have been able to deal with them?—Well, they could have, but not in time to be of any use: that is the difficulty.

94. Q. Why should there be any difficulty; the Mamladar goes about and makes enquiries?—There would be no difficulty if the Mamladar went round promptly, but he has other pressing business; sometimes he has magisterial work or an emergent report to write; these cause a delay to some extent in the disposal of applications. And then again a man's *bona fides* has to be enquired into.

95. Q. You could get information of encumbrances on the land from the Registrar's office?—Sometimes they don't register the mortgages.

96. Q. Then they are not valid?—No; in some cases they are not.

97. Q. In other cases a registered document is not valid and is no better than an unregistered document?—No, a registered document is better than an unregistered document; but in some cases the land is transferred to relatives or sub-sharers by a private settlement, without a document.

98. Q. I suppose Registrars could give you the information in a few days?—It would take a week, as the registers are not well kept. Then the cultivator might have mortgaged it so long as 50 years ago.

99. Q. Special officers were appointed during the famine to grant *takavi*?—Yes.

100. Q. With reference to the system of applications for water, is there any certainty under the present system that a *rayat* who gets water in one year will get it again next year?—There is no certainty; it depends upon the sanction of the Executive Engineer; he may sanction whichever application he likes.

101. Q. Does not that to some extent prevent a *rayat* from sinking a well to supplement canal irrigation?—No; well irrigation is always considered by the people to be more expensive.

102. Q. But I refer to wells built to supplement canal irrigation?—The soil that is favourable for canal irrigation is equally favourable for well irrigation.

103. Q. What you mean is that for high-class crops irrigation is required?—Yes.

104. Q. In some tanks and canals irrigation is likely to fail during some months?—Yes.

105. Q. To supplement irrigation in those months would not the *rayat* sink a well if he was certain that the canal would fail?—Yes, if the soil is favourable.

106. Q. Assuming it is favourable?—Yes, but we thereby give the man who does that the monopoly and deprive others of the benefits of the tank irrigation. Sometimes we give water to one man, sometimes to another, according to who needs it most.

107. Q. Could you not allot a definite area to each individual once for all and class it as wet in all ordinary years?—That can be done; but without experience I cannot say whether it will be to the advantage of the *rayat* or not.

108. Q. Why should there be any doubt upon that point?—The quantity of water in the tank varies and sometimes there is more to give than sufficient for the limited area that may be fixed.

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109. Q. He could apply for an additional area and pay more. When there is a deficiency of supply the Canal officers give a reduced quantity?—Yes, sometimes the water is only sufficient for the cultivation of crops near the canal and the supply has to be restricted accordingly. Moreover, if, under the fixed area system, the whole of such area is planted with such crops requiring large quantities of water in a year of drought, the whole quantity in the tank, which could more usefully be utilized for raising food-grain crops will be absorbed by the higher crops.

110. Q. In times of drought you restrict the area proportionately?—Yes; the available water is turned to the best advantage for growing food-grain crops. However, some such arrangement as you suggest might be tried for 3 or 4 years in the parts where scarcity is experienced.

111. Q. In paragraph 3 you say, "from the experience of small dams thrown across small streams to collect water for crops requiring more water it would appear that tanks constructed in black soil will hold water." Have you personal experience of this?—No.

112. Q. Are the suggestions you make in your memorandum being carried out?—I think they are being given definite shape to in the office of the Executive Engineer.

113. Q. Do you know if an enhanced assessment will be charged at the next revision of settlement on land irrigated by new wells?—No; I don't think anything extra will be charged, because it is an improvement made by private capital.

114. Q. If the class of cultivation is changed the assessment is increased?—Yes, only if the nature of the soil is changed by putting manure, by levelling the ground, etc., which is necessary in an irrigated plot; but the water-advantage is not taxed as such.

115. Q. Are you in favour of Government making a well and charging an enhanced assessment?—No, I think the construction of wells should be left to the people; the only part that I would recommend Government to take in well construction is to find out and tap the water for the *rayat*. The rest should be left to the cultivators themselves.

TWENTY-SEVENTH DAY.

Bijapur, 6th January 1902.

WITNESS No. 67.—MR. W. W. DREW, I.C.S., Collector of Bijapur.

Memo. by witness.

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1. This District is constantly suffering from failure of crops. From 1863-76 there were five or six bad years. Then followed sixteen years of abnormal prosperity, but, to make up, the crops have failed five times during the latest eleven years, and there is no reason, that I see, to anticipate that it will fare very much better in the future, apart from irrigation. In 1896-97 the late rains completely failed, and in 1899-1900 there was practically no *khari* rain, though there was a very heavy fall early in September. In the other three years the rainfall was not short by more than a very few inches below the average, and yet there was something like a 2-anna crop only. This was because the land here must get not only its average fall almost to an inch, but it must get it at exactly the right moment. The soil evidently cannot get on, as it used to with a rainfall slightly short of its average. It has been exhausted, as it never gets manured.

2. The first necessity is to stimulate the rainfall. In 1891 a quantity of dynamite was exploded with this object, but it was done when there was an absolutely clear sky, and naturally there was no result. During the last two monsoons it looked almost daily as it is meant to come down in torrents, but the clouds used to pass over simply because there was nothing to bring down the rain. So I recommend that tree planting be undertaken on a large scale. Nothing has been done by the Forest Department here so far. Planting and watering trees might form part of the famine programme too. Suitable places could be found where there would be sufficient water for both trees and workers.

3. Next I think that no unoccupied land should ever be given out without an agreement being taken that the intending occupant will make wells capable of irrigating a half or some other fixed proportion of it. The full assessment of the land is 14 lakhs. In the last two years a total of 19½ lakhs was collected, of which 3 lakhs were due to the scare caused by the sudden introduction of the Land Revenue Code Amendment Bill. This year I do not expect to collect more than 5½ lakhs. The cost of relief works, almost entirely unremunerative, and of gratuitous relief has been 11½ lakhs in the last two years, and it will be at a moderate estimate 4 lakhs this year. The uncollected revenue may some of it be eventually collected, but the greater portion will certainly have to be remitted. Eight and half lakhs have been advanced as *Tagai* for seed and cattle, of which 2½ lakhs are recommended for remission, and there will be great difficulty in recovering the remainder. So the famine expenditure has been 24 lakhs against an income from Land Revenue of 25½. Therefore it is not very profitable to Government to have the land in this District cultivated as long as it remains unirrigated. Nor is it to the occupants. They exist only through charity. Far better would it be for them to seek land

where cultivation is not so precarious. Land unsuited to irrigation or which nobody will take up I would add to the forests. Even if not immediately productive, it would at any rate not increase the number of mouths to be fed in the next year of scarcity; and would afford employment.

4. Speaking as a man with no pretence to scientific knowledge, I think, that wells are far more suitable to this district than tanks. The only modern tank, at Muchkundi near Bagalkot, which cost about a lakh, is altogether unremunerative, and irrigates only about 40 acres. For it an extra rate is paid by those using the water according to the acreage for which it is used. Other Government works, for which a consolidated rate is paid, irrigate about 1,440 acres, village and private works 2,200 acres. Fifteen-thousand and eight hundred acres are irrigated by wells. The total culturable area is 3,227,000 acres. In the last two years most of the tanks ran quite dry, and they were useless, even for supplying water to the wells by percolation. The beds were given out for cultivation in at least three cases. The large tanks, Sangogi in Indi taluka and Hullur in Muddebihal, which are now being constructed as famine relief works, should, I think, be completed, as so much has already been spent on them, and their catchment area is so great that they would not run dry in any year with as much rain as the recent famine years. But smaller tanks, I would not recommend, except as relief works during actual famine.

5. Wells must be constructed by the people themselves, with help from Government. They can do them much more cheaply than Government can. They would be suspicious of Government doing work for them on their lands. They would imagine some deep laid scheme to oust them.

6. More liberal *takavi* advances might be given, provided that the work is carefully watched and the whole advance is not made at once. To begin with, only enough to enable the recipient to find water should be advanced. When that is spent, if water has not been found, but the money has been honestly spent and there is reasonable chance of its being found, more might be advanced. Money fruitlessly spent in this way might be remitted, even though water were eventually found, and where after diligent search it had to be abandoned, it should always be remitted. Some officials undervalue the security offered, and forget that as the work progresses the value of the security increases. By giving the loan in instalments a sum sufficient for the most *pakka* well can be advanced with safety. A supply of the best boring apparatus should be kept at the head-quarters of every taluka for the use of *rayats* requiring them, the hire being treated as part of the advance. This would be especially useful for deepening wells. The present rate of interest need not be changed, nor need there be more liberal remissions, except when water is not found. But I would extend the period for

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re-payment to 20 years, so that some of the burden may be borne by the next generation, and to cause inducements to keep up the wells. There is always a tendency not to use a well in a year of abundant rainfall, and, if by any good fortune there is a run of these, the wells fall into disrepair. Last year there were 132 more irrigation wells in the district than five years previously, but there were 68 more in disuse, and of *kachcha* wells there were nearly 400 more in disuse. It might be made a condition of the loan that not only was the work to be completed in a certain time, as is the practice now, but that it should be kept in good working order till at least the date for repayment of

the last instalment. It seems to me that it is the best soils that require the deepest wells and also that suffer most by a season of scanty rain, and the occupants of those want special encouragement to sink them. This can be effected best by liberal loans repayable in an extended period.

7. Doubtless a large number of wells ran dry during the last two years, but many continued all through with somewhat diminished supply. Some were deepened. Others could have been, if implements had been more largely available. Those that continued were the saving of the District. They afforded work to many and grew much needed grain and still more needed fodder.

1. Q. (*The President*)—You have been Collector of Bijapur for two years?—Yes; I came here just two years ago at the beginning of famine.

2. Q. Do you know the district very well?—Yes; a good deal of my time was spent in connection with the famine.

3. Q. Have you only seen this district during its bad times?—No; I was here as Assistant Collector for a year about 13 years ago.

4. Q. You say that there were 16 years of abnormal prosperity?—Yes, 16 years without famine; there was scarcely such a time before.

5. Q. The famine of 1877-78 was terrible?—Yes; it was the worst on record, but the 1896 famine was very bad.

6. Q. You say "Nothing has been done by the Forest Department here so far. Planting and watering trees might form part of the famine programme." Do you think trees would grow well in this district?—Yes; I know that in Bijapur there were no trees in my compound 15 years ago, but there are a great number now. Trees grow well without much care, but they must be planted near water.

7. Q. You propose that "No unoccupied land should ever be given out without an agreement being taken that the intending occupant will make wells capable of irrigating a half or some other fixed proportion of it." Is an application made before occupying land?—That was not the system in my time.

8. Q. Do you think there would be such a demand for agricultural land in this district as would induce people to make such an agreement?—I think, if they were given *takavi* and told that they would not have the land if they did not protect it by wells as proposed in my memo., they would do it.

9. Q. You say "In the last two years a total of 19½ lakhs was collected of which three lakhs were due to the scare caused by the sudden introduction of the Land Revenue Code Amendment Bill"?—Yes; out of 28 lakhs.

10. Q. You say that cost of gratuitous relief has been 11½ lakhs?—Yes; we find that on the whole we have spent five lakhs more than our income from all sources during the last two years.

11. Q. You say "Wells are far more suitable to the district than tanks." What is the variation in the depth of wells?—They are not often deeper than 50 feet.

12. Q. (*Mr. Ibbotson*)—Often less?—Yes; 30 feet I think sometimes.

13. Q. (*The President*)—Do you find brackish water in these wells?—Yes; in particular parts.

14. Q. In large parts of the district?—Yes; a good deal, I think.

15. Q. Are wells cut through trap rock?—Yes; after boring a great deal of deepening has been done lately.

16. Q. Do you consider that a larger area could be cultivated if there were wells?—Yes; but they do not use wells in a good year as it does not pay them.

17. Q. Do the people grow higher class crops under wells?—Yes; vegetables and sometimes a little sugarcane.

18. Q. Is there much black soil in the district?—I think that there is a good deal more black soil than the other soils in the culturable area, but I am not certain.

19. Q. You say the Muchkundi tank is quite unremunerative and irrigates only 40 acres. What other Government works are there?—There are some old works. There is the Madag tank; which belongs to the Mahomedan times; it is irrigation tank; and under it the people pay a consolidated rate; altogether it irrigates only 1,440 acres?

20. Q. Are there any village and private works?—Yes; there are a few.

21. Q. (*Mr. Muir-Mackenzie*)—In what part of the district?—I cannot remember having seen any of them.

22. Q. Are there any rice tanks?—No; I think they grow vegetables.

23. Q. (*The President*)—The Muchkundi tank has been a great failure?—Yes; I think so.

24. Q. You recommend that the large tanks in Sangogi and Hallur should be completed?—Yes, I think so; as we have spent so much on them.

25. Q. Are they pretty well advanced?—The Sangogi is well advanced, the other not so far.

26. Q. None of the superstructures have been completed?—No; none at all.

27. Q. The capacity of the tank will be 2,845 million cubic feet?—Yes.

28. Q. You say more liberal *takavi* advances might be given provided that the work is carefully watched and the whole advance is not made at once?—Yes, but I would spread the re-payment over a longer time. I would show a good deal of liberality.

29. Q. What is the present period?—Ten years.

30. Q. You have provision to allow more in the Code?—Yes.

31. Q. (*Mr. Muir-Mackenzie*)—You cannot exceed 20 years without the sanction of Government?—No.

32. Q. (*The President*)—We find that every where the full period is not allowed?—I think that 10 years are usually granted.

33. Q. Do you think 20 years long enough?—Yes, except in some places where it may be raised to 25 years.

34. Q. (*Mr. Higham*)—Could you give 20 years now?—I am not sure.

35. Q. (*The President*)—You say "last year there were 132 more irrigation wells dug in the district than five years previously"?—I got that from the returns.

36. Q. Of *kachcha* wells nearly 400 remained disused? Were they not deep enough?—I think they were silted up.

37. Q. The high rates obtained last year for crop produce ought to make them exert themselves the more to work their wells?—Yes, those who used them found themselves benefited.

38. Q. Is the area under well irrigation falling off?—I should not have thought so.

39. Q. Have you the figures?—No.

40. Q. I think the high rate created a very great inducement to increase well irrigation?—Yes; I think so.

41. Q. In this district there are very few wells compared with others?—It is a very small number indeed.

42. Q. (*Mr. Higham*)—You say irrigation is not resorted to under the Muchkundi tank by the people; why is that?—I think they are afraid water will not last if they commence to take it for perennial crops.

43. Q. I see from one of the statements, prepared by you that there is invariably some water left?—I should say they do not care about it; they prefer the ordinary dry crops.

44. Q. Would not that apply to any new tank that might be made?—Yes; I think, it will deduct from its paying capacity certainly.

45. Q. Is the water-rate you charge too high?—No; I think the ordinary rate is Rs. 2. I do not think it is too much. I do not think that lowering would induce many more people to take it.

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46. Q. On second class works of which the management is left to the people, do they take water every year?—Yes, because they have to pay whether they take it or not.

47. Q. Do you think it is possible to put such works as the Muchkundi tank on the same basis?—I do not think we could do that under the present law.

48. Q. Is the tank a paying one?—Nothing like it; it does not pay the expenses.

49. Q. Why not allow people to manage the Muchkundi tank themselves?—I don't think they would keep it in good order.

50. Q. There could not be much risk in making the experiment?—No.

51. Q. So far as your experience goes in this district the people are reluctant to take the water?—Yes; they certainly are.

52. Q. There is no reason to suppose it would be otherwise if you made new tanks?—I don't think it would unless a consolidated rate is put on.

53. Q. At the next settlement or at once?—I should say at the next settlement.

54. Q. Would people like that or would they prefer to pay a water-rate?—I think if they had the choice they would prefer a water-rate. They could then take water when they liked.

55. Q. Do you think irrigation tanks are more likely to be developed if you put on a consolidated rate?—Yes.

56. Q. (Mr. Ibbetson)—Do you think that the people refuse to take the water from the mere fact that they are not sure that the water-supply will last?—I think that is partly the reason.

57. Q. Do you think that is mainly the cause?—I think so; in time they will be accustomed to a tank supply.

58. Q. At present they get water from wells which last all the year round?—Yes, in bad years the tanks run dry.

59. Q. In ordinary years, in a year of average rainfall, have you any storage which water lasts throughout the year besides wells?—Yes; I think the water of one canal lasts through the year.

60. Q. Up to June?—Yes; quite up to June.

61. Q. Do you know what the people grow mainly?—Vegetables.

62. Q. High-class crop?—Yes.

63. Q. Do they use the water every year in ordinary years?—Yes.

64. Q. Under wells in ordinary years do they water dry crops at all?—I am afraid, I don't know.

65. Q. In famine years they do so?—Yes; a great deal.

66. Q. You say a great number of wells lie disused?—Yes.

67. Q. If a man has laid out his capital in preparing the land for cultivation of high class crops, do you think he allows his well to go out of use?—I think his descendants don't use it.

68. Q. Could you say from your observations during those past two years how far well-irrigation prevented people from going on relief works?—It did so to a very large extent indeed.

69. Q. Have you noticed a marked difference between the villages where well-irrigation exists and those where it does not?—Yes; a great deal of difference.

70. Q. Does that apply to villages under tanks?—No, there was hardly any water in the tanks.

71. Q. It is mainly in the villages under wells?—Yes; the water in wells near tanks lasted for a long time.

72. Q. Do you think that in any village or villages that you know of there was so much protection from wells that they did not send any body on relief works?—I think so.

73. Q. Could you give us any idea at all of what proportion of the cultivable area was irrigated by wells in these villages roughly?—I should not think more than one-tenth.

74. Q. Not more than that?—No.

75. Q. So far as your experience goes if a village has that proportion of its area irrigated by wells it would have sufficient protection against famine?—Yes; but I could not be quite sure.

76. Q. If a village had a quarter of its area irrigated by wells you would regard it as safe?—Yes, certainly.

77. Q. Would you be inclined to put it at one-eighth?—Yes.

78. Q. Speaking of these other Government works on which a consolidated rate is paid, are there any large works among them?—I mean works under which 2 or 3 villages irrigated?—I think under the Mandipur two villages are irrigated.

79. Q. Do they manage their own distribution?—Yes.

80. Q. We were told that people cannot combine in these parts so as to arrange their own distribution?—I think they can.

81. Q. Your experience leads you to think so?—Yes.

82. Q. What has been the history of your wells during these past 2 years? You had famine in 1896-97 and then I believe, you had a year of good rain fall?—Yes, but, I believe, that some of the villages have not had rain for 5 years.

83. Q. In 1899 when the second famine came, how did the wells stand? Had they had a full supply?—I think so.

84. Q. Since then, I suppose, they have more or less failed?—Yes.

85. Q. When did they begin to fail?—About January 1900.

86. Q. As early as that?—Yes; we began to feel the pinch for water from January 1900.

87. Q. From that time things became worse?—Yes.

88. Q. What proportion of their normal area, do you suppose, the wells could water now?—I should think about one-half.

89. Q. Not more than half?—No.

90. Q. The increase in area of lands irrigated was due to wells, which were partly disused, being brought into use again?—Yes; I think so.

91. Q. As regards *takavi* you recommend that, when water is not found owing to causes which are not under the control of man, the money should be remitted?—Yes.

92. Q. Would that be advisable; would it not give an opening for fraud? We have been told by witness after witness that it would be inadvisable in Bombay; a man would take Rs. 500 to make a well and spend only Rs. 200 on it, applying the rest to his own use and then say "I cannot find water and I must be let off." What do you think?—I don't believe that to be possible as long as we have supervision. If we have an establishment to supervise these works I don't see how that could be the case. You can see if he has dug a hole and you can find out how much it has cost.

93. Q. Do you think that the supervision at present available would be sufficient?—It is a question how large your establishment is.

94. Q. In a year like the one you have lately experienced, applications for *takavi* are more numerous than in ordinary years?—Yes.

95. Q. In such a year but not in an ordinary year you would want an extra staff?—Yes.

96. Q. Where the subordinate officers have to make reports as to the yield of crops or areas, or any matter in which Government and the cultivator are concerned, is it your experience that their tendency is to overstate or understate the facts, to lean slightly towards the Government side or the reverse?—I do not believe that the subordinate village officers lean to Government,—probably the Mamlatdar does.

97. Q. The agency in their report would at any rate not be likely to report that something more has been spent than has really been the case. Suppose a man has borrowed Rs. 500 and spent only Rs. 400, in their report what would the Mamlatdars say?—What is your experience?—The Mamlatdars would be on the Government side.

98. Q. There would not be very much danger of Government losing money in the way I have indicated;—No, I don't think so.

99. Q. Have you any experience of boring apparatus?—No, none at all.

100. Q. A considerable number of wells were made during the famine years of 1896-97, are most of them *kachcha*?—I could not tell the proportion but I have seen both *kachcha* and *pakka*.

101. Q. What is your impression? Are there as many *kachcha* as *pakka*?—The people generally get money and make them *pakka*.

102. Q. Are there a good many *kachcha* wells?—Yes.

103. Q. A great many.—Yes.

104. Q. Would it be worthwhile making efforts to get these made *pakka*?—Suppose you were to offer them additional *takavi* grants on easy terms, do you think that the people would be induced to make them *pakka*?—Yes; a good many have been made *pakka*.

105. Q. Do you think it would be a great inducement if you could tell the people that you would take no interest?—I don't think that would make very much difference. I don't think the people mind paying the interest.

106. Q. If you were prepared to advance money on ordinary terms do you think they would take it.—Yes, I think so.

107. Q. In regard to grants for wells have you ever had complaints about the amount granted not being enough to make a well?—Yes, I have.

108. Q. Is the insufficiency of the grant due to the fact that the land is perhaps hardly sufficient security?—I think it is partly due to that. Then the Maulatdars, as they are responsible, are very cautious.

109. Q. Apart from that is it your experience that in many parts of India there is a feeling that *takavi* is a sort of debt of honour which must be repaid?—No.

110. Q. You don't think that that is the feeling?—I have never heard of it.

111. Q. (Mr. Higham)—Is it regarded as a discreditable thing to take *takavi*?—Not at all.

112. Q. (Mr. Ibbetson)—You say "it seems to me that it is the best soils that require the deepest wells" you are speaking from experience?—I think so; of course, I do not know very much of the question of digging wells in black soil. I think it is the most difficult soil to get a well in.

113. Q. It pays best when a well is deeper?—Yes, but in very many places you cannot get water.

114. Q. You are distinctly of opinion that there are a considerable number of wells that have been made that are still efficient and are not used in good years in this district?—Yes; I think so.

115. Q. (The President)—Are they not not used for want of cattle?—No; it was not worth the labour.

116. Q. (Mr. Rajaratna Mdlr.)—On the Muchkundi Tank the average area irrigated is 43 acres and assessment Rs. 244?—Yes.

117. Q. That gives an average about of Rs. 8 per acre?—Yes.

118. Q. Do not you think that a high rate considering the uncertainty of the water-supply?—Perhaps it is.

119. Q. (Mr. Muir-Mackenzie)—The rate, I suppose, depends upon the crop?—Yes; I believe it is Rs. 8 on some crops and Rs. 2 to Rs. 4 on others.

120. Q. (Mr. Rajaratna Mdlr.)—From Mr. Lawrence's table it seems that the number of wells has increased from 3,787 in 1886-87 to 7,185 in 1896-97. Has there been a further increase since 1896-97?—Yes; I think so.

121. Q. Could you give the approximate number now existing?—I am afraid I have not got figures with me.

122. Q. In one of the memoranda submitted by a Mamlatdar it is stated that the amount of *takavi* is generally fixed at 20 times the assessment. Is that a rule?—There is no general rule laid down, but it is fixed on the amount we would pay if the land was to be taken up.

123. Q. (The President)—Do you use up all the money that Government allots for *takavi*?—Yes, we use up as much as we get and we generally ask for more.

124. Q. Would you get more if you asked for it?—I think that, it depends upon the Government of India.

125. Q. (Mr. Muir-Mackenzie)—During the last famine was the Government of India very liberal?—Yes, as far as I know they were.

126. Q. (Mr. Rajaratna Mdlr.)—Have you any statement showing the amount of *takavi* advanced in 1900-1901?—Yes.

Mr. Muir-Mackenzie.—I think you will find it in Mr. Lawrence's book.

127. Q. (Mr. Rajaratna Mdlr.)—Up to 1899 to 1900 five lakhs of rupees were advanced for the construction of wells. The figures for last year are not given?—We advanced about 2 and 3 lakhs, not altogether for wells.

128. Q. Excluding last year, you advanced 5 lakhs of rupees during the previous ten years for wells alone?—Yes.

129. Q. Is the number constructed out of this known?—Yes, I can get the figure for you.

130. Q. About Rs. 50,000 were granted for other irrigation works. Is there anything known as to what these other irrigation works chiefly were?—I suppose the making of small canals and bunds.

131. Q. Is any information available as to the number of wells not completed owing to the insufficiency of *takavi* advances?—I cannot say; I shall ascertain if the figures are available.

132. Q. Would it not be advisable to give enough money to enable the people to complete the wells?—Yes, I think it would be advisable.

133. Q. You say "three lakhs collected were due to the scare caused by the sudden introduction of the Land Revenue Code Amendment Bill"?—When the Land Revenue Bill was first introduced the people did not understand its object or its effects, and consequently during the first week or two after it first appeared in the papers the people rushed to pay. If they had known that revenue had been suspended they would have waited.

134. Q. They paid up the arrears?—Yes.

135. Q. (Mr. Muir-Mackenzie)—What proportion of the district do you think it would be necessary to thoroughly afforest in order to make that plan afford some appreciable protection to the district?—I could not say.

136. Q. Do you think it would be one-third?—I could not say.

137. Q. About one-fifth?—Yes that would be more like it.

138. Q. Do you not think the scheme might be outside the range of practical politics?—Perhaps it might be.

139. Q. Do you think that the power to withstand drought would be increased by increasing the number of *tals*?—I don't think that *tals* are of much use in a bad year. They might increase the fodder crop.

140. Q. I thought I noticed that there was a difference on the line of railway in those fields which have bunds?—They might improve the fodder even in a bad year; but they would probably make only a little difference in a grain crop.

141. Q. Do you consider fourteen or fifteen years without famine the normal period for this district?—No. It was abnormal.

142. Q. On what grounds?—From previous experience; I don't think we ever had 16 years without famine or without severe distress: 1890-1891 was a year of distress.

143. Q. In that year did Government collect all the land revenue?—I do not know what they collected.

144. They did collect something. Do you remember how many people there were on relief in that year?—I cannot say.

145. Q. Assuming that Government collected most of the revenue in 1891 and 1892, I gather that after 1876 and up to 1901, Government lost about one year's land revenue, in addition to the expenses incurred on famine relief?—Yes.

146. Q. Did the people relinquish much land?—No; because we suspended payment of assessment.

147. Q. Did you find people deserting the villages?—Yes. A great many went away, but most of them came back.

148. Q. The point of my question is, whether in 1877, a large number of people deserted and did not come back?—So I have heard.

149. Q. And their lands were put into forests?—Yes.

150. Q. What do you regard as about the cost of a well of average depth?—Between Rs. 500 and Rs. 1,000 for a *pakka* well.

151. Q. For an ordinary well?—About Rs. 600 to Rs. 700.

152. Q. Would you be glad to see famine labour employed on bunds and *tals*?—I do not quite believe in the employment of famine labour on private persons' lands.

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153. Q. Do you think that it would be difficult?—I have not thought about it at all; I think it would be difficult to employ famine labour on private persons' lands. They could do the work cheaper themselves.

154. Q. But, suppose they were not charged, and Government did it for nothing?—Then there would be no objection. Perhaps the people would be suspicious at first; but they would get reconciled. The question would be the organization of labour.

155. Q. Do you see any difficulty about organization?—We would have to treat a whole village at a time, so as to decrease the cost of supervision.

156. Q. Do you think any insuperable difficulty would arise?—No.

157. Q. On the whole, you are in favour of that scheme?—I would rather have it than making more roads.

158. Q. Would you rather employ famine labour on *tals* than on tanks?—No; I would rather employ it on tanks.

159. Q. Was any proposal made to employ famine labour on these bunds?—No; not in this district. It was done in the Jath Stato but without any great success. The present Administrator does not believe it; he thinks that the cost is out of all proportions to the profit.

160. Q. The last Administrator thought he might employ famine labour more economically within the State?—Yes.

161. Q. Besides the second class works are there any small irrigation works in your district?—Yes.

162. Q. Would you like to see their number increased?—I don't think that would do much good; I think if more money were sunk in wells it would be more profitable.

163. Q. If the existing tanks were improved or new tanks constructed do you think that the people would use the water?—I do not think they would in ordinary years.

164. Q. On those works on which they use water do you think they use it economically?—I think so; I have not heard of any disputes or complaints.

165. Q. You have never heard complaints of the water being wasted?—No; I have not.

166. Q. (Mr. Ibbetson)—Do you think that people are prevented from laying out money in irrigation works by the fear of increased assessment?—I don't think the people know that improvements cannot be taxed.

167. Q. One of your own Mamlatdars was not quite sure about it?—Yes; the people do not know, as well as they ought to, that improvements on lands will not result in an increase of assessment at the next revision of settlement.

WITNESS No. 68.—MR. RAGHAVENDRA SHAMRAO BAITMANGALKAR, District Deputy Collector, Bijapur.

Answers to printed questions.

I.

Mr. Baitmangalkar. Point No. 2.—The gross area of the Bijapur district in acres for the year 1900-1901 is 3,628,789.

The culturable area of the district is 3,227,208 acres.

6 Jan. 02. Area irrigated in 19,428 acres. In round figures this comes to about 20,000 acres.

The different sources from which water-supply is secured to this area are as follows:—

	Acres.
(1) Government Irrigation works	1,440
(2) By private or village works	2,202
(3) By wells	15,786

The proportion of area irrigated by Government works of the total culturable area is 1 to 160, i.e., 0.625 per cent; that of area irrigated by private or village works is 0.688 per cent; that irrigated by wells is 49.375 per cent.

The nature of the country is undulating and consists of varieties of the soil as shown below:—

	R. a. p.
Totally red soil	0 5 4
Totally black soil	0 5 4
Mixture of black and red soil together	0 5 4

i.e., a third of the total area may be assigned to each of the three above-mentioned classes.

The statistics relating to rainfall are as shown below:—

	Inches.	cents.
1895	20	67
1896	9	24
1897	21	61
1898	26	32
1899	22	17
1900	20	99
1901	16	44

There is ordinarily a demand for water in the districts of Bijapur and Dhárwár during the south-west monsoon for the reason that the two tracts are not totally rabi crop-growing districts. In Bijapur the whole of Bádámi, more than three-fourths of Hungund and Bágalkot are tracts adapted for kharif juári. Portions of Muddebihal, Sindgi and the whole of Bágévádi, i.e., the portion going by the name of Don valley, may be said to be not in need of water during the south-west monsoon, as the soil thereof is more adapted for the growth of late crops, such as late juári, gram, wheat, etc., as well as cotton. The other portions of the district are suited for the raising of kharif crops. It is for this reason that there exists a demand for water in the months of June, July and the early part of August. In the case of Dhárwár I must say that the whole of the district, except Navalgund and parts of Ron and Gadag

excluding Mundargi, needs water during the south-west monsoon. Early juári is the principal staple raised in this district in the non-mallad portions of Dhárwár, Hubli and Bankapur. The whole of Hángal, Kalghargi and Kod, where early rice is the principal staple grown, rain is essentially necessary during the south-west monsoon.

The following is a list of the crops which require irrigation both in the districts of Bijapur and Dhárwár, with the exception that in the first-mentioned district cocoa palm and supari (betel-nuts) are not raised in its gardens, while in the mallad gardens of the last-mentioned district the two above garden crops are raised for the most part:—

	Duration for attaining maturity.
1. Onions	3 months
2. Coriander seed	2 "
3. Khopuli or joda palm	4 "
4. Carrots	4 "
5. Sweet potatoes	4 "
6. Chillies	4 "
7. Plantains	12 "
8. Sugarcane	12 "
9. Maize	3 "
10. Fodder juári	3 "
11. Brinjals and other vegetables	2 "
12. Rále	3 "

All these crops require ordinarily two waterings in a week in the district of Bijapur. In the case of superior soils which could retain moisture, one watering is said to be enough in a week. In this respect the case of Dhárwár differs to some extent from that of Bijapur. In Dhárwár, especially in the tract which lies to the west of the Pooná-Harihar Road, some of the garden crops, such as onions, carrots, chillies and maize, are raised during the south-west monsoon without irrigation.

Of these, onions, garlic, sweet potatoes, fodder juári, brinjals, etc., are sown in Bijapur after Diváli, i.e., in the cold weather. The rest are sown in the commencement of Mrga Sál, i.e., early in June.

The distribution of water in the case of Government Irrigation works is controlled by the officers and subordinates of the Irrigation Department both in the districts of Bijapur and Dhárwár. Distribution from Government tanks in both the districts and from wells which are for the most part private property does not need any control, for the reason that in the case of irrigation from private wells the area irrigated is, as a rule, the property of one individual, and as such, does not need the necessity of control. In the case of tank-irrigation also the fact that a larger proportion of lands dependent on that kind of irrigation has been assessed at consolidated rates has minimised the necessity of control in water distribution. The villagers amongst themselves choose a rayat and entrust him with the duty of water distribution. He is called the "Nirmanegár." He is paid generally in kind by the rayats holding lands under the particular tank. It is this "Nirmanegár" who distri-

butes water to the village lands in the order of rotation according to custom. The instances in which the rayats had to invoke the assistance of authorities by a suit in the Mámlatdár's Court under Act No. III of 1876 for the removal of obstruction caused to the flow of water for the irrigation of their lands were so few in the interval of nearly 15 years, during which I held the office of Mámlat in the districts of Bijápúr, Dhárwár and Kanara, that I am prepared to say that the existing arrangements call for no cause of interference. Irrigation revenue is realized in the forms of distinct water rate and consolidated assessment in the two districts. The first-mentioned form of realization is only adopted in the case of recent irrigation works as shown below :—

Bijápúr	Muchkundi tank.
Dhárwár	<ol style="list-style-type: none"> 1. Madag canal. 2. Dambal tank. 3. Medleri tank. 4. Asundi tank.

In the case of all the other irrigation works consolidated assessment is levied.

The extent to which cultivation is dependent on artificial irrigation has already been stated above. On the whole the area so irrigated does not exceed 1060 per cent. of the total culturable area of the district of Bijápúr. The statistics of Dhárwár are not available with me.

Point No. 4.—Out of 17 Government irrigation works which stand registered in public accounts in Bijápúr, 5 are streams or nalas wherefrom water is made available for irrigation. The rest are tanks as shown in the accompanying Statement B. In the case of Dhárwár I am sorry I was unable to collect the necessary statistics, having had to sever my connection with the district just at the time when I was called upon to answer these queries for the information of the Irrigation Commission. However, I take this opportunity of placing at the disposal of the Honourable Commission such information as I possess on the subject. As a Sub-Divisional Officer in charge of the four southern talukas of Dhárwár I had reason to see two canal works and a certain number of village tanks, all being Government irrigation works. The two canal works are (1) the Madag and (2) Dharma canals. The first-mentioned work is a diversion of the floods of the Kumadavati River which rises in a large lake called Madag tank. The tank proper is situated in the limits of the Mysore Province. This is an ancient irrigation work, said to have been constructed a few hundred years ago by the former rulers of the land and appears to have been abandoned at the time of the introduction of the British rule. It has been restored to its former use nearly half a century ago after the advent of British Power. Two canals have been constructed and they irrigate lands of about seven villages in the Kod Taluka. The other principal work goes by the name of Dharma canal. This is a diversion of the floods of the Dharma River in the Hángal Taluka. Water has been diverted into the canal at two different places by throwing stone embankments across the bed of the stream. These two diversions or canals irrigate the rice and bágait lands of about 23 villages. All the other Government irrigation works fall within the category of village tanks. Both the Dharma canal and the majority of tanks are ancient works and are now under the management of Dhárwár Irrigation Department. Except Madag tank or Madag canal all the other tank works proved a

failure in the year of scanty rainfall of 1899-1900. I cannot say that Dharma canal proved to be a total failure. In the years of average rainfall the irrigators used to get three waterings, but in 1899-1900 many villages did not even get one watering. In many cases the outturn of crop raised by irrigation went down as low as two to three annas in the rupee. The capacities of Asundi and Mellari in Rauebennur Taluka have been recently increased by the Irrigation Department.

Regarding the range of variation I have to add that there are, under irrigation in the case of each particular work alluded to above, the areas likely to fluctuate or vary according to the quantity of supply available in them. This again depends upon the rainfall of the year. In the year of ample fall the area under irrigation does not show a falling off, whereas in a year of scanty fall there happens to be a corresponding diminution in the area irrigated.

Point No. 6.—By district or village works I understand that they are meant to designate the works constructed at the cost of District or Taluka Local Board funds for irrigation purposes. So far as I am aware, no such works do exist either in the district of Bijápúr or in Dhárwár. The resources of these local bodies are not, in my opinion, sufficient to undertake such works. In their present financial strain they cannot be expected to go beyond the objects provided for in Bombay Act No. I of 1884. In these circumstances I am not prepared to suggest the execution of such works by the local bodies.

Point No. 7.—Total area irrigated by wells in ordinary years in Bijápúr is about 10,000 acres. Number of new wells constructed during the last 10 years is about 2,700. Information is not available as to the number constructed annually. The accompanying statement, marked A, shows the extent to which takávi advances have been made for the construction of wells in Bijápúr during the last 10 years. So far as I am aware, no concessions have been given to the constructors of new wells. In my opinion it is desirable to stimulate the construction of new wells by more liberal advances. Owing to scanty rainfall in 1899-1900 the wells in the districts of Bijápúr and Dhárwár had run dry in almost every case in the following year. In cases in which betel vine irrigation solely depended upon well-supply the owners of the gardens had to deepen the surface or clear silt in order to make their crops survive. In the case of wells in gardens, which depended upon tank-supply, the wells had miserably run dry, and the supari crop had to suffer serious damage in Dhárwár. I had to notice this in Hángal particularly. The people had to cut down a large number of supari trees and use the dead wood in putting up their plague sheds. In the case of the wells which had the sub-soil drainage or percolation supply from tanks the average depth of water below surface was found to reach from 15 to 20 feet or thereabouts. In the case of other wells the depth was observed to reach from 30 to 50 feet. The cost of an average well for irrigation much depends upon the nature of soil to be excavated and the distance at which the water-bearing strata would reach. Generally wells dug beside the nalas and rivers cost less than those dug in black soils. The cost of a well falling within the former class comes to about Rs. 200 to Rs. 250. In the case of other wells the outlay may be estimated to cost about Rs. 500 to Rs. 1,000. The area served by an ordinary well may be estimated at about 15 acres or thereabouts.

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(A)—Statement showing takávi advances given for the construction and repairs of wells, tanks and other sources of irrigation and improvement of lands in Bijápúr District from 1890-1891 to 1899-1900.

Year.	Total advances under Land Improvement Act.	FOR IRRIGATION PURPOSES.				For improvement of land.
		Wells.	Tanks.	Other sources.	Total.	
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
1890-1891	2,200	1,200	...	...	1,200	1,000
1891-1892	2,24,791	76,787	200	47,497	1,24,484	1,00,307
1892-1893	14,802	3,222	1,700	...	4,922	9,880
1893-1894	51,485	3,290	...	...	3,290	48,195
1894-1895	1,25,950	15,630	...	...	15,630	1,10,320
1895-1896	97,020	7,775	...	...	7,775	89,245
1896-1897	9,18,625	3,51,870	...	1,220	3,52,890	5,65,735
1897-1898	19,330	4,675	4,675	14,655
1898-1899	32,567	6,920	6,920	25,647
1899-1900	1,46,113	41,750	41,750	1,04,365

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(B)—Statement of consolidated revenue from Irrigation Works for the year 1900-1901—Canal Return No. VIII.

No.	Name of work.	AREAS ASSESSED UNDER THE SETTLEMENT.			AREAS CULTIVATED DURING THE YEAR.			ASSESSMENT OF THE YEAR.			REMISSIONS FROM ASSESSMENT MADE DURING THE YEAR.			Net consolidated assessment during the year.	Irrigation share.	Land share.	REMARKS AS TO HOW THE SHARES HAVE BEEN ARRIVED AT AND THE AUTHORITY UNDER WHICH CALCULATED. INFORMATION ADDED AS PER GOVERNMENT RESOLUTION No. 35—446 OF 8TH MARCH 1891.		
		Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.	Kharif.	Rabi.	Total.						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	Assessment on team land.	Judi.	Nafa.
																	Rs. A. P.	Rs. A. P.	Rs. A. P.
1	Mamdapur Jagod																		
	Muramkeri "Doddadu"	625		625	625		625	3,630		3,630				3,630	2,905	725	1,407 10 0	404 13 7	1,002 12 5
2	Do. "Sannadu"																		
3	Kumatgi Delhi Khan Vizir Keri	55		55	55		55	151		151				151	121	30	.....	.....	.....
4	Sirur "Dodakeri"	16		16	16		16	69		69				69	56	13	.....	.....	.....
5	Banshunkari Honda	40		40	40		40	286		286				286	236	59	580 0 0	(A) 442 10 1	154 15 5
6	Saraswati Nallah	82		82	82		82	616		616				616	493	123			
7	Nilgund Arkeri	3		3	3		3	11		11				11	9	2	.....	.....	.....
8	Timeagur "Dodkeri"	72		72	72		72	172		172				172	138	34	28 8 0	9 8 0	19 0 0
9	Do. "Sunkeri"	35		35	35		35	91		91				91	73	18	59 4 0	46 2 0	13 2 0
10	Parvatikeri	82		82	82		82	383		383				383	307	76	224 8 0	89 7 0	135 1 0
11	Do. Ganjikeri	44		44	44		44	136		136				136	109	27	55 8 0	14 2 11	41 5 1
12	Kendur Tank	256		256	256		256	1,436		1,436				1,436	1,149	287	768 8 0	702 6 3	66 1 9
13	Gowandki Hond	14		14	14		14	98		98				98	79	19	49 0 0	2 4 0	46 12 0
14	Checlapur stream	19		19	19		19	66		66				66	53	13	5 8 0	1 2 3	4 5 9
15	Hire Upnal stream	17		17	17		17	36		36				36	29	7	.....	.....	.....
16	Konnur stream	30		30	30		30	73		73				73	59	14	.....	.....	.....
17	Palthi stream	50		50	50		50	135		135				135	108	27	.....	.....	.....
		1,440		1,440	1,440		1,440	7,398		7,398				7,398	5,921	1,474	3,187 6 0	1,712 8 1	1,483 7 5

(A) Includes Rs. 8-9-0 on account of Judi in excess of the Revision Settlement.

II.

A.—GENERAL.

The answers below refer to the districts of Bijapur and Dhárwár. As a Mámlatdar and a Sub-Divisional Officer I have had a fair opportunity of becoming acquainted with these tracts.

2. The average rainfall of Bijapur in an ordinary year of rainfall is as shown below:—

Bijapur (Taluka Bagalkot).

	Inches.	cents.
1895	20	67
1896	9	24
1897	21	91
1898	26	82
1899	22	17
1900	20	99
1901	16	44

I am sorry I cannot supply the information for the district of Dhárwár as I was obliged to sever my connection with that district when I was required to answer to these queries owing to my transfer to Bijapur.

3. So far as I am aware, the under-mentioned causes may prove to be obstacles to the extension of irrigation in the above-mentioned tracts:—

- (1) Pure black cotton soils of Navalgund and parts of Gadag and Ron in Dhárwár.
- (2) Parts of Hungund, Sindgi and Bagevadi in Bijapur with black cotton soil.
- (3) Lack of capital for the initial expenditure, etc.
- (4) Uncertainty of the supply of water, etc.

With these exceptions, in the other portions of the two districts irrigation may possibly be extended if due provision for water be made.

4. So far as I can recollect, no orders appear to be in force which exempt land irrigated from works constructed by private capital from liability to the payment of enhanced assessment for a certain and specified period. But in this connection I cannot refrain from quoting the liberal provisions made in the Bombay Land Revenue Code, which prohibit the enhancement of assessment accruing to the land from the improvements effected at the cost of private capital during the currency of a settlement, and I beg to take the opportunity of inviting the attention of the Honourable Commission to the orders of Government passed so far back as 1874 for the assessment of land irrigable from wells constructed from private capitals. Therein the rate of fixing assessment is restricted to the highest dry crop rate. That rate is Rs. 1-10-0 in Bagalkot, Rs. 1-8-0 in Badami and Rs. 1-4-0 in Hungund and Rs. 1-2-0 in the rest of the talukas of the Bijapur District.

In Dhárwár the maximum dry crop rate in some of the talukas of which I relinquished charge recently was Rs. 2-4-0 per acre, if I remember it rightly. I believe the rate in the neighbourhood of Hubli and Dhárwár must be far in excess of the above-mentioned rate.

So far as I am aware, tenants do not extend irrigation at their own cost in the tracts alluded to above. The duty of making extensions to irrigation generally devolves on the owner of the land. Tenants possess no proprietary title in the land to be irrigated. Hence they do not come forward to lay out their capital for the benefit of the landlord, who can, if he pleases, at any moment oust them of their possessions. In my opinion the existing provisions are not quite sufficient to induce capitalist landlords to invest more money on irrigation in a tract where the assessment on dry crop lands is light and where the owner is sure to be profited by raising cotton and wheat crops without risk, expense and trouble in years of average rainfall.

5. The experience gained in the last few years has convinced me that the cultivators of pure black cotton soil lands do not come forward to take tagái freely for the

sinking of wells. As has been observed above, the cultivators try to obtain as much tagái money as possible for the eradication of weeds and the construction of embankments, etc., to drain off flood water or to retain moisture. The existing rules as to the recovery of tagái loans are rather stringent and in my opinion deserve being made more elastic in practice. Unless Government are prepared to show to the borrower all the leniency which a sowkar now shows to his debtor, I apprehend the tagái loans will not become as popular as possible. When the question is considered in a financial pressure point of view I am of opinion that the plan will not prove workable. Of course the special concessions recommended in clauses 1 to 6 of this query may tend to the encouragement of tagái loans.

6. So far as the two districts are concerned, extension of irrigation does not tend to injure remaining cultivation. The staple crop is juri for the most part and the other valuable crop is cotton, which can be raised comparatively with less trouble and expense than the irrigable crops; so the people would not take up irrigation to the detriment of the less troublesome cultivation.

So far as the district of Bijápúr and the non-mallad portion of Dhárwár are concerned, people do not evince any desire to extend irrigation to their lands for the above-mentioned reason.

For instance, the northern portion of Hirekerur and the southern portion of Ranebennur within a radius of 10 or 12 miles from Byadgi would not willingly undertake irrigation instead of growing chillies as a dry crop; so the rayat holding black soil lands in the non-mallad portions of the Dhárwár District and in the district of Bijapur would not prefer to resort to irrigation instead of raising early and late juri, wheat, gram, cotton, etc.

C.—CANALS OF INTERMITTENT FLOW.

12. I have not had any experience of canal irrigation in the Bijápúr District. In the district of Dhárwár I had come across the Dharma and Madag canals. Dharma canal is supplied with water during the rains by the floods of the Dharma River, while that of Madag is supplied with water of Kamadwari River. Two lands have been constructed to the Dharma River at two different places in two separate villages. The water of the main stream is diverted to the canal proper by throwing embankments across the rivers. Outlets built of stone masonry are constructed at reasonable intervals and the water is made to flow from the bed of the canal to the outlets through pipes or conduits and thence it is distributed to the fields by means of pats or channels. During the interval I had charge of the southern sub-division of Dhárwár I did not receive any complaint from the villagers who depended upon the Madag canal regarding the inadequacy of supply. In the year 1899-1900, which proved most unfavourable even to the mallad tracts, the supply in the Madag canal did not fail, and the distribution was carefully controlled and regulated by the officers of the Irrigation Department, and the holders of lands which depended upon water for irrigation had the good luck of raising two crops. It was quite the reverse in the case of Dharma canal. The bed of this canal ordinarily gets dry at the end of January or thereabouts. In 1899 and 1900 the canal bed ran dry as early as October when waterings were necessary for standing rice. There were constant complaints from the villagers who depended upon this supply that the distribution was unequal and that underhand dealings were also attributed to the subordinates of the Irrigation Department on whom the responsibility of distribution lay. In the case of this canal no second crop is raised by irrigation except pulses raised in rice lands subsequent to the cutting of rice while no watering is necessary. In the case of Madag it is supposed that a perennial supply is maintained in the year of ample rainfall. In that of Dharma the supply does not last beyond the month of January, i.e., till the close of the kharif harvest. In the year of scanty rainfall the experience of 1899-1900 proved that the canal bed ran dry as early as October, when the kharif, including paddy, wanted water very badly. I have not had an opportunity of trying these two canals in a year of drought. It is for this reason that I have classed Madag canal under class 'C' of intermittent flow and not under class 'B' of continuous flow.

14. So far as the rice grown in the mallad tracts of Dhárwár is concerned, too late a commencement and too early a cessation of the supply are considered to be prejudicial to the growth of the crop. It is a general idea that howsoever a good supply of water were maintained in a canal, still rice crop is not supposed to yield a bumper out-turn unless the paddy when in ears does not benefit itself

by the late rains of October—what are locally termed the falls of Uttara and Hasta Nakshatras. Hence it is necessary that rice should be sown as early as it would admit of being in ears in September to October. Any cessation of late rains is sure to bring about a failure of crops. The harvest of 1899-1900 of Hángal and Kod talukas is a clear evidence of my above assertion. I have not had the opportunity of observing the effects of too late a commencement of irrigation.

15. I have not as yet come across any canal irrigation which was supplemented by irrigation from wells given to the same land. I cannot therefore satisfactorily answer this question.

D.—TANKS.

23. (1) The tanks in the villages traversed by the Dharma canal receive their supply from the canal. Other tanks in Hángal and Kod talukas receive their supplies from monsoon floods which drain the neighbouring uplands. The Bijápúr tanks receive their supply from monsoon floods.

(2) Water is distributed to the land by means of sluices or outlets constructed at convenient centres in the dam through pipes or masonry channels, water eventually reaching the irrigable lands by pats or channels.

(3) The supply is ordinarily maintained throughout the year, i.e., till it is replenished by the storm or monsoon floods of the following year in a year of ample rainfall so as to suffice for the irrigation of sugarcane, cocoa palm, betel vine and supari palms. In a year of scanty rainfall the supply hardly meets the requirements for the growth of paddy. In the majority of cases the beds run dry in a year of scanty rainfall. Then it is out of question to expect that they should retain their supply in a year of drought. The tank of Hirekerur is a typical instance of tanks having run dry in the years 1893-1901. In these two years the tank beds were given out for the raising of autumn crops inasmuch as they had run dry.

(4) The area irrigated from a tank depends upon its capacity to hold water. A line has been drawn by the Dhárwár Irrigation Department by which it has undertaken the management of tanks which irrigate an area over and above 50 acres. The management of tanks irrigating less than the above standard is left to the owners of lands benefited by them. As for the areas irrigable by the Bijápúr tanks, particulars will be found in the accompanying statement.

24. So far as the tanks of Dhárwár are concerned, the supply available therein is not utilized in cultivating two harvests even in years of ample rainfall. I think this must be due to the apprehension that the supply would prove insufficient for the perennial crops such as sugarcane, betel vines, cocoa palm, supari, etc., which require watering throughout the year and which depend upon the tank supply. Ordinarily after rice cutting fields which are capable of retaining moisture are sown with the second crop of pulses, such as gram, mug and urid. These crops do not require watering. They grow by the sub-soil moisture and that brought on by the dews of cold weather. In years of scanty rainfall such as that of 1899-1900 and 1900-1901, the value of the produce of land under irrigation did certainly increase, but I think it was due more to the prevailing high prices rather than to the fact of irrigation. When the supply is available all round the year valuable crops, such as plantains, sugarcane, cocoa and supari, are raised. In years of scanty fall these crops suffer.

In the case of irrigable crops years of scanty rainfall bring about more profit, due to the limited supply fetching high prices.

25. The reply given to question No. 14 holds good to this query.

26. So far as I am aware, tank irrigation ordinarily needs being supplemented by irrigation from wells given to the same land. This is especially necessary in the case of sugarcane, betel vine, etc., during the hot weather months when the supply available in the tank begins to run short. This is only possible in a year of ample rainfall. In a year of scanty rainfall when the tank beds had run dry the crop raised therein had to suffer to a material extent. I have had to observe such damage done to the sugarcane and supari crops in the villages of Hángal and Hattimattur in the Dhárwár District in the year 1899-1900. Generally the supply in the Dhárwár irrigation wells which are sunk in the gardens commanded by irrigation tanks is co-existent with the tank supply.

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Mr. Baimangalkar. Hence in a year of scanty rainfall or in that of drought the wells cannot be depended upon to supply irrigation to the garden crops.

28. In the northern portion of Bijápúr District the rent usually paid by the cultivators to the owner of the land is a fourth part of the produce. The liability of paying land revenue devolves on the owner. No private canals do exist in the two above-mentioned districts; hence no payment has to be made on this account in these districts. Generally the rate of rent for irrigated lands is less than that prevailing for dry crop land. The reason for this is obvious. Irrigation, in whatever form it is practised, is more expensive than the raising of non-irrigable crops. The only exception to this rule, so far as I have observed, is in the case of mallad gardens, where valuable crops, such as supari, betel vine and cocoa are rented. In these cases, though the initial cost is heavy, their up-keep is not said to cost much. In these cases the rent may go up to one-half of the annual produce, the liability to payment of land revenue devolving always upon the owner.

In the case of irrigated lands in the Bijápúr District the maximum rate is as follows:—

Talukas.	Rice rate. Rs.	Garden rate. Rs.
Siudgi	4	5
Indi	4	5
Bijápúr	8	8
Bágerádi	4	8
Muddebiál	4	5
Bágalkot	8	...
Hungund	8	8
Bádámi	8	8

29. The answer to this question much depends upon the distance from which water is to be taken. Expenditure necessary to bring water to the field is not a heavy item on the occupant. For preparing the land for irrigation a sum of Rs. 12 to Rs. 15 is said to be necessary; ploughing Rs. 5 per acre; levelling Rs. 5; manuring Rs. 2 to Rs. 5; miscellaneous, *nil*.

This is generally incurred by the tenant. The tenant recoups this expenditure by allowing the landlord a smaller share of the produce. Three-fourths of the outturn by way of compensation, etc., go to the tenant. In the northern portion of Bijápúr supply of manure does not prove to be an item of heavy expenditure, inasmuch as the rayat is said to be capable of getting a supply without payment. This is said to be due to a large supply available without proportionate demand. In this part of the country manure is not given to dry crop lands as is the case in the three southern talukas of Bijápúr and throughout the district of Dhárwár. Hence manure can be had in the northern portion of Bijápúr without much expense.

30. In the case of Government tanks irrigating more than 50 acres in each case minor repairs, such as the clearance of water channels and the filling in of cart ruts caused to the dams due to cart traffic and the like, are supposed to be executed by the owners of lands benefited by tank irrigation. Practically these repairs are not punctually executed by the parties concerned.

The work is generally got done by the use of pressure brought to bear upon them through the agency of village and taluka officials. The average cost does not exceed more than annas eight an acre in the ordinary cases of repairs. I do not remember of any instance of total neglect or refusal on the part of irrigators to execute these repairs which by custom and usage they are required to do. For these reasons I do not advocate the necessity of any legislation in this direction.

31. There are no tanks constructed by private persons either in Bijápúr or Dhárwár. As stated in paragraph above, the management of tanks irrigating an area less than 50 acres vests in the villagers. It is supposed that they should execute the necessary repairs at their own cost, but practically repairs are not executed and the beds become gradually silted. Urgent repairs to outlets and channels are executed by the villagers.

The lands under Dhárwár and Bijápúr irrigation tracts have as a rule been assessed at consolidated rates. Hence no difficulty arises in the realization of revenue. In case of dispute as to the use or rotation of flow of water to the fields, the existing law, Act No. III of 1876, provides ample remedy for getting immediate redress. No further legislation is necessary in this connection.

32. Construction of further tanks by private persons is not feasible either in Bijápúr or in Dhárwár Districts. I do not think it advisable to take any action in this

direction. As a rule all culturable lands have already been taken up by rayats. Construction of a new tank will entail fresh acquisition which will not prove to be an easy job to the rayat.

E.—WELLS.

34. (1) The average depth of permanent wells in the Bijápúr and southern talukas of Dhárwár comes to from 30 to 50 feet. In the case of wells sunk in gardens which depend upon tank irrigation the average depth is not as low as those which do not depend upon that source. The depth of the wells falling within the last-mentioned category is from 10 to 20 feet from the surface.

(2) The majority of the wells in the two districts derive their supply from springs. Supply from percolation is mostly confined to wells sunk on the banks of nalas, the percentage of which does not exceed 12 per cent. The supply generally fails in the hot weather, in years of scanty rainfall and in years of drought. In the years of average fall the supply does not diminish.

(3) The cost of construction varies according to the class of land wherein excavation has to be made and the depth at which water-bearing strata can be reached.

In the localities where the circumstances are favourable the cost of sinking an average well with masonry wall on one side together with a masonry platform and the provision of pulleys comes to about Rs. 500. If masonry walls have to be built on all the four sides the cost would proportionately increase to Rs. 1,000 to Rs. 2,000 according to the kind of stones used. If dressed stones are made use of, then the item of expenditure will increase. The wages of a stone mason in an ordinary year comes to about eight annas a day.

(4) A *pakka* well of the above-mentioned description needs no repairs. Only it needs silt clearance once in 15 years or thereabouts.

(5) Lift is the only mode in which water is generally drawn up for the purpose of irrigation.

(6) The average area attached to and commanded by a well may not exceed 5 to 10 acres at the most.

(7) No portion of the area capable of being irrigated by a well is allowed to lie waste in a year except for unavoidable causes.

35. It is an undisputed fact that two harvests instead of one can be made on lands irrigable by a well, and the value of crop raised thereon must turn out to be double of what could be raised from it by the sowing of kharif crop.

The general idea is that the soil is not adapted for the growth of valuable garden crops such as supari and cocoa palm, etc., in Bijápúr and non-mallad portions of Dhárwár. Cultivation of vegetables does not add much to the increased value of the produce of the land.

Sugarcane may add to the increased value of the produce, but its cultivation is not extensively resorted to for the apparent reason that a valuable crop such as an exotic cotton can be raised with comparatively little outlay and less trouble as well as to the fact of apprehension that the supply of water would prove insufficient during hot weather.

Ghur is not ordinarily manufactured from sugarcane in Bijápúr and the non-mallad portions of Dhárwár. It is generally used for consumption in the form of juice extracted from cane in its raw form. The same reason holds good for the valuable crop of betel vine, the cultivation of which is not much resorted to in the gardens of Bijápúr and those of the non-mallad tracts of Dhárwár. The only instance of exception to this rule in the Bijápúr District which I remember is that of Tolachgod gardens wherein betel vine is raised.

38. So far as I am aware, serious difficulties are likely to be encountered with in some cases in which well-sinking projects are intended to be taken up, though I am not prepared to say that they happen in almost every case of well construction. From the experience gained in this direction as a Vice-President and President of the Local Boards, I am of opinion that some assistance by way of expert advice is desirable in this connection in order to obviate the loss that would otherwise happen to the borrower and the waste of public money lent by Government. Some instances of failure of well projects have been brought to light which were solely due to want of expert advice in the selection of sites for well-sinking. I do not mean by this that the necessary agency is totally wanting in the district. Quacks are found everywhere whom the cultivators ordinarily consult. In some cases even astrologers too are consulted.

As a rule the stock available is from uneducated class, and as such, the advice given by them does not turn out as useful as that emanating from educated agency, hence the necessity of expert advice which is of some material value.

In the construction I have not had the experience of rayats having encountered with difficulties. I am not aware of any instance in which assistance has been given either by Government or by the local bodies in the construction of wells in the shape of expert advice, etc., The best practicable way for attaining this object would be to utilize the services of overseers and sub-overseers attached to the Local Boards in the inspection of sites before the commencement of sinking and excavation work; secondly, to relieve the borrower of his liability to pay for the cost of boring in all cases in which the projects have resulted in

failures; thirdly, to increase the number of instalments of repayment of loans granted for well-sinking; and fourthly, to reduce the rate of interest to $3\frac{1}{2}$ per cent. or so. By these concessions, I think an impetus would be given to more well-construction businesses.

39. The proposal is not likely to meet with the approval of the general body of rayats, on the ground that cost to be incurred by the Government agency would be enormous as compared with that executed by the rayat himself. Favourable concessions, such as remission of interest and the increase in the number of instalments of repayment, may stimulate the borrowers to consent to Government constructing wells in their private property.

40. I do not recommend the introduction of temporary wells in the tracts to which the above remarks refer.

Mr.
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1. Q. (*The President*).—You are District Deputy Collector of Bijapur?—Yes.

2. Q. How long have you held that post?—In this district only 2 months.

3. Q. Before that where were you?—I was in Dhárwár.

4. Q. How long?—Nearly 2 years.

5. Q. Where did you get your previous experience?—I was Mamlatdar in this district for 4 years (1885 to 1888), having previously been Awal Karkun. Then I was Mamlatdar in the Kanara District for 3 years, thereafter Mamlatdar and District Deputy Collector for about 10 years in the Dhárwár District. I came back to Bijapur in November last.

6. Q. You say in paragraph 5, "experience gained in the last few years has convinced me that the cultivators of pure black cotton soil lands do not come forward to take *takavi* freely for the sinking of wells."—Wells are not popular in the pure black cotton soil?—No; that is my experience.

7. Q. That is, in about one-third of the district?—Yes.

8. Q. Is it the same proportion in Dhárwár?—Yes, except in the mallad tracts where red soil predominates,

9. Q. What would you recommend for the protection of those parts of the district which are not favourable for irrigation and are of black cotton soil?—I think canal irrigation would be the best thing; they can raise sugarcane in black cotton soil from canal water and also from wells.

10. Q. Not from wells?—No; there is some difficulty about the depth of the water in wells.

11. Q. We have evidence in this district from other people that in ordinary years they do not irrigate black cotton soil?—No; they raise cotton and other crops and get a moderate profit out of them; that is my experience.

12. Q. Do you approve of small village tanks. Do you think they are really useful to the country?—Yes, in the mallad or hilly tracts and not in black soil tracts where these small tanks will not prove useful for the raising of dry crops.

13. Q. (*Mr. Ibbatson*).—Did you say small tanks; could they be made useful?—I meant small wells.

14. Q. *Kacheha* wells?—Yes.

15. Q. (*The President*).—There are not very many wells in this district?—There are some places in this district in which the depth of a well from the surface goes down more than 100 or 130 feet. There are villages which have come under my observation in which the Public Works Department have abandoned well-sinking.

16. Q. Why?—Because after sinking shafts over 100 feet no water has been reached.

17. Q. What kind of wells?—Wells for drinking water supply. Well-sinking is not possible throughout the district. On the banks of *nalas* and rivers it is possible.

18. Q. I gather in Dhárwár there are many small tanks on the western side of the district?—Yes.

19. Q. The country here is like the eastern part of Dhárwár?—Yes.

20. Q. Are there many tanks in the east part of Dhárwár?—So far as I know, there is only one big irrigation tank.

21. Q. No small village tanks?—Yes, there are some in the Dhárwár District but none in Bijapur.

22. Q. With your experience of this district what do you think would be the best thing for Government to do to help people so that they should not suffer if another famine occurred?—I would recommend the sinking of wells—*pakka* and *kacheha*—in places where water could be got near the *nalas* and canal irrigation by the bunding up of the rivers Ghatprabha, etc.

23. Q. But there are a great number of places where there are no *nalas*?—It is possible to bund the river, and make canals that would give some protection.

24. Q. Are there no canals?—There are none in Bijapur. There are 2 in Dhárwár—one is called Madag canal and the other Dharma canal.

25. Q. That has not done much good?—I cannot say that the canals have done no good. On the contrary, they have been beneficial in saving the tracts, through which they traverse, from failure of crops to some extent. The only exception to this was the year 1899-1900.

26. Q. What do you think would be the best thing for the future?—Beyond sinking wells in favourable tracts and the construction of canals, no other remedy suggests itself to me.

27. Q. You say, "in my opinion it is desirable to stimulate the construction of new wells by more liberal advances"?—How would you do that; would you give smaller instalments or give up the interest?—I think the rules must be made more elastic and sympathetic in regard to recovering the advances. The conditions of repayment are too strict.

28. Q. What are the strict conditions of repayment which you would like to see removed?—The sowkar generally lends money without any particular period of recovery. If Government were not to recover the instalments on the date on which they become due and give extensions of time that would be an inducement to well-sinkers.

29. Q. How many years do you give for repayment?—Generally ten; from five to ten.

30. Q. Why don't you allow more time?—That is the general practice.

31. Q. What is the Government term?—Twenty years is the maximum.

32. Q. Why don't the District Officers give twenty years when that is allowed by law?—In practice we do not give the twenty years' time.

33. Q. Is there any concession which you think might be made?—In the case of well-sinking in some cases the people do not succeed on account of depth to which they have to go; in those cases if Government remitted the advance it would be a great inducement.

34. Q. Don't you think that the cultivator might take advantage of that. He might spend the money on a different thing and then come and say "I tried but I can get no water"?—Such instances may have occurred, but are so few that they may be left out of consideration.

35. Q. You don't think it is very common?—No; we have to guard against them by frequent inspection of works.

36. Q. Do you find it difficult to recover advances of *takavi*?—No; so far as my experience goes there is no difficulty.

37. Q. They pay?—Yes; and are very glad, if you give them an extension occasionally.

38. Q. Have you given them extensions sometimes?—I have in some cases; not exactly in well-sinking but on general loans.

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39. Q. Do you think the rate of interest ought to be lowered?—People don't care so much about interest because the present rate is low as compared with what the sowkar charges.

40. Q.—What does the sowkar charge?—About 18 per cent. to 24 per cent. per annum.

41. Q. As much as 24 per cent?—Yes; our rate is so moderate that it is no use lowering it.

42. Q. Do you think if Government were to say to the cultivator 'We will pay you Rs. 500 to dig a well; we will not ask it back; only you must pay wet rates for the future by a stated periodical assessment changing every 30 years' would the cultivator take advantage of that and build many wells?—It will prove a very good inducement. The cultivator would pay a water rate if the initial cost of sinking a well is not charged to him. This concession will not be much availed of by rayats inasmuch as irrigation by wells is attended with much expense and trouble.

43. Q. You say the construction of tanks by private persons is not feasible.—No.

44. Q. Why not?—It is a speculation; so far as this district is concerned. The rainfall is precarious and there is no water. It depends entirely upon the facilities of getting water; the chief thing is the certainty of finding water; if a man is assured that even in years of drought the supply would last one or two years then of course the Inamdars would run the hazard.

45. Q. Are there many Inamdars in these places?—Not many enterprising Inamdars.

46. Q. When a cultivator takes a *takavi* advance and makes a well, does he expect to be charged the wet rate?—In the case of a new well, Government does not charge any extra rate.

47. Q. Does he know that?—Yes; because he only pays assessment on the land. Our rule is that we charge only the highest *jarayat* rate for well sunk from private capital.

48. Q. (Mr. Ibbetson)—You say in your note that there is no enhanced assessment during the currency of the present settlement?—Yes.

49. Q. What will happen at the next revision of settlement?—In the last revision there was a rule that in cases where wells are made from private capital the rate should not be enhanced.

50. Q. Do the people know that?—I think they know it; there may be some who do not know it; but in most instances the people do know it.

51. Q. If you know it is a permanent remission why do you use the words "during the currency of the present settlement"?—I have said that the settlement which we make is for a period of 30 years. That I think led me to write the clause.

52. Q. You now know that no enhancement would be made after the currency of the present settlement?—Yes.

53. Q. Yet you put in these words?—Yes.

54. Q. (Mr. Higham)—Supposing there were a large irrigation work in Bijapur with a constant supply of water, what crop would the people irrigate? Would they grow sugarcane?—Yes; now people grow sugarcane from both well and canal irrigation. The fact is that the people of this district are not accustomed to the irrigation of crops but in the course of years when they become gradually accustomed to it, I think they will grow sugarcane, plantains, cereals, and *juari* by irrigation.

55. Q. Would that take a great many years?—A good many years; because unless they become accustomed to irrigation they won't take to it.

56. Q. Is the soil adapted for high class crops?—Yes; if a sufficient quantity of manure is used.

57. Q. How long does a well last?—It depends upon the structure; if it is well built with stone, it may last for a century or so.

58. Q. You say in Dhárwar tank irrigates more than 50 acres?—Yes.

59. Q. Who are these entirely managed by?—By the Irrigation Department.

60. Q. B, whom are the larger tanks managed?—By the Irrigation Department.

61. Q. When a man wants to irrigate from one of the larger tanks does he have to send in an application?—There are some tanks which are directly under the Irrigation

Department for which they charge a water rate; in that case the people have to make applications for permission and pay the water rate which is charged according to the scale. There are many other tanks for cultivation on which a consolidated rate is charged. They don't charge a special water rate in such cases and no application is necessary.

62. Q. Not even when the tank is a large one?—It does not matter how large the tank is.

63. Q. Supposing there are 2 or 3 villages irrigating from that tank don't they have to apply for water?—Water is given in rotation; there are agents appointed who give it in turns and control the distribution.

64. Q. Are these agents appointed by the Irrigation Department?—Yes.

65. Q. (The President)—You mean the "Nirmanegars"—Yes.

66. Q. How can they work unless they have applications. How are they to control the distribution?—My remarks apply to the tanks which are fed by the Dharma Canal. Many tanks are fed by that canal. It is only in the case of those tanks that the Irrigation Department interfere and control the water distribution.

67. Q. That is in Dhárwar?—Yes. In the case of village tanks the Patels and Nirmanegars manage them; the area being limited no difficulty arises.

68. Q. Do you think the 50 acres' limit might be increased; could a tank irrigating more than 50 acres be transferred to the management of the people themselves?—I think not; that would not work well.

69. Q. Do you think it better that the tanks should be under Government management than under the management of the people?—Yes.

70. Q. Even if they irrigate less than 50 acres?—Yes; that would do much better.

71. Q. In the case of certain tanks for which a water rate is realized if arrangements were made that the villagers should pay something like an average for the last few years—a fixed sum—would they irrigate more freely?—That system would not in my opinion work well.

72. Q. They would not irrigate a larger area?—No.

73. Q. Take the Muchkundi tank which irrigates 42 acres; on that they pay an average assessment of Rs. 111. Supposing they were asked to pay Rs. 111 down and then to take as much water as they liked would they irrigate more than they do at present?—Who is to distribute the water? If the distribution is left to themselves then complaints would follow. One man by his influence would get more water and another less.

74. Q. Supposing that Government officials distribute it; you give them as much water as they like without charging anything more than Rs. 111; would they then take water?—I am of opinion that disinclination on the part of rayats to take water for irrigation from Muchkundi tank is due more to the insufficiency of supply for perennial irrigation than to any other cause. The people are not accustomed to raise monsoon or other non-perennial crops. They generally do not need water for their ordinary dry crops in years of average rainfall. Their idea is that canal water should be taken only for raising sugarcane and plantain crops and the existing supply hardly meets the requirements of the rayats for perennial irrigation.

75. Q. Why should not the Nirmanegars distribute it?—That system does not prevail in this district; it prevails in the Dhárwar district.

76. Q. (Mr. Muir-Mackenzie)—Why should you not employ Nirmanegars here?—I don't see any objection.

77. Q. On the Muchkundi tank why should not they have Nirmanegars?—In the first place the people in this district are not accustomed to irrigation. It is new to them. If they are put in the way by the appointment of the Nirmanegars they may utilize their services.

78. Q. It may be tried as an experiment?—Yes.

79. Q. (Mr. Rajaratna Mdl)—Do you know anything about the Nilgundi tank in this district?—I know that it has been abandoned.

80. Q. Why was it abandoned?—Owing to the insubstantial condition of the village; the people said malaria prevailed there, especially in cold weather, and the tank was filled.

81. Q. There was waterlogging at that time?—Yes.

82. Q. In Dhárwar the number of tanks shows a decrease in 1891-92 as compared with the figures for 1886-

87. Could you explain the reason of that?—Yes a large

number were in disrepair, they were more attended to in 1893-94 or thereabouts.

83. Q. In 1899-1900 the area irrigated by tanks declined from about 83,000 acres to less than 20,000 acres?—Yes; that was of course due to famine.

84. Q. Was any remission of assessment granted on this tank?—No; there was some suspension in that year so far as I can remember.

85. Q. There are Government canals in Dhárwār?—There are two.

86. Q. The area under the Government canals was 6,000 acres in 1892-93; and it has gradually declined year by year. Do you know the reason of it?—I have not made inquiries about it.

87. Q. The average area irrigated per well is given as .77 for Dhárwār, whereas it rises up to 3.00 in Bijápúr and to 2.70 acres in Belgaum. Why is it so small in Dhárwār?—Well irrigation is not resorted to there on an extensive scale. There is a good tank system in Dhárwār; and the people mainly depend on the tanks. I think that is the only reason.

88. Q. You say "the existence of tanks does not raise the spring level of wells"?—No, that is a mistake. My answer needs correction. The existence of tanks does raise the spring level of wells to a large extent. I have experience of this with regard to the wells in the gardens of Hungul town and Hutimatur village in Kuragi taluka of Dhárwār.

89. Q. Have you any reason to think that the system of recording the area irrigated is defective and that the small average is due to that cause?—Yes; it may be so to some extent.

90. Q. At the revision of settlement is there not a general enhancement of assessment on all lands?—Yes, generally, but it depends upon circumstances. I remember some cases in which the assessment was lowered at the revision in the year 1886-87 in the Badami taluka.

91. Q. Do you know of any taluka in which the assessment was enhanced at the revision owing to the rise in prices?—Of course there are such; but there are also cases in which assessment is lowered.

92. Q. Where enhanced assessment is charged have you reason to believe that it has been more on land with wells than on land without wells?—In the case of well irrigation the assessment is, as a rule, restricted to the highest dry crop rate; beyond that there is no enhancement.

93. Q. The rayats understand that?—Yes.

94. Q. You give a statement at the end of your note showing the proportions for irrigation and for land revenue? would you explain how it is arrived at?—One-fifth for land and four-fifths for water.

95. Q. You work it out according to that rate?—Yes.

96. Q. As regards the management of tanks, those irrigating less than 50 acres were handed over to the rayats or to the Revenue officers?—The rayats manage them and repair them.

97. Q. They are bound to provide for the repairs of these tanks?—Yes, that is understood.

98. Q. Is any abatement made in the assessment?—No.

99. Q. Not as compensation for carrying out the repairs?—No.

100. Q. (Mr. Muir-Mackenzie)—The whole of your experience has been chiefly in the Dhárwār district?—Yes.

101. Q. The Hangal and Kod (34) talukas suffered badly from famine?—In 1899 they suffered to some extent.

102. Q. In those two talukas there are many tanks?—Yes.

103. Q. Are there many tanks in the other talukas?—A few.

104. Q. Small tanks?—No, not many.

105. Q. Are there many tanks in Karaggi?—Only a few.

106. Q. How do they lie—to the west of the railway?—Yes.

107. Q. Generally speaking the tracts in which many of those small tanks are, did not suffer in the least from famine?—Yes.

108. Q. Do you think the existence of these small tanks contributed materially to the protection of these tracts?—I cannot say so. But the existence of the tanks and the fact that the tracts in which they lie receive early rainfall, have mainly contributed to the protection of these areas. In these tracts heavy rainfall instead of doing good causes damage to the dry crops. The people in some places sow their lands with rice as well as the dry crops, such as juari, bajri or ragi. If the rainfall proves sufficient and seasonable throughout the season, they raise their rice crop and neglect the less valuable juari or bajri. If, on the other hand, the rainfall proves insufficient they reap their dry crop and forego the rice. The rainfall though insufficient for rice, is always enough for dry crops. Hence the peculiar situation of the country between maidan on one side and the maidan or plains on the other may be said to have contributed to the protection of these areas from famine.

109. Q. Do you think it can be said there has been less suffering in these tracts owing to the existence of these tanks?—Yes.

110. Q. Would you therefore be prepared to advocate the construction by Government of more of these small tanks in the eastern parts?—The eastern part is generally well adapted for growing cotton and juari.

111. Q. The construction of tanks would not be suitable?—No, I think not.

112. Q. In the western parts is the soil adapted for rice?—Yes.

113. Q. The soil is different?—Yes.

114. Q. (The President)—Those western talukas are Malnar?—Yes.

115. Q. (Mr. Jebbetson)—What does that mean?—They are hilly.

116. Q. (The President)—They never suffered very much from famine?—Last time they did suffer, i.e., in 1899-00 to some extent.

117. Q. (Mr. Muir-Mackenzie)—Because there was a short rainfall?—Yes.

118. Q. In the eastern parts is the soil suitable for making tanks?—No. I think not as suitable as the western parts.

119. Q. When a rayat constructs a well without getting any *takari* from Government does he generally go to the sowkar for money?—Yes. But only well-to-do rayats generally invest their capital in the enterprise.

120. Q. The latter seldom have to go to the sowkar?—Very seldom.

121. Q. Do they ever go to the sowkar?—Yes, they do sometimes.

122. Q. What sort of agreement does the sowkar make?—Yes, they demand so much interest.

123. Q. In how many years has the money to be returned?—There are cases in which it is not returned; the debt goes on from father to son.

124. Q. He does not contract to pay it back in a fixed number of years?—No, when they raise a crop they pay the sowkar and again raise a loan from him; it is a sort of running account.

125. Q. If a sort of running arrangement could be made with Government do you think they would be ready to borrow from Government?—I think so.

126. Q. Supposing Government decided upon abandoning the interest and allowing the rayat to pay back a portion of the capital advanced only, when it is convenient, do you think that would be a great inducement?—Yes; it is my opinion that many rayats would come forward.

127. Q. Do you think that the result would be that the rayat would never pay back the capital to Government?—No, certainly not; they are not so unfaithful, many would pay; the percentage of non-payers would not be more than 1 per cent. or 2 per cent.

128. Q. If left to themselves how long do you think they would take to repay the loan?—In good years they would come forward voluntarily; it would only be in years of scarcity or bad harvest they would fail to pay.

129. Q. On an average would they pay back within 20 years?—Certainly.

130. Q. You have a great deal of black cotton soil in your district?—Yes.

131. Q. Is it very deep?—Yes.

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132. Q. How far down is the *muram*?—Below 50 or 60 feet.

133. Q. In Bijápur is the black cotton soil so deep?—Yes.

134. Q. None of the parts of Dhárwár in which you have served have black cotton soil so deep?—Approximately they have the same depth as Bijápur.

135. Q. Do you think there is anything in the soil that makes it badly suited for irrigation?—So far as well-irrigation is concerned it is expensive to go so deep.

136. Q. I want to know about the soil. Suppose canal water is given?—Even if canal water were given I don't think the rayats would be prepared to avail themselves of the advantage on an extensive scale in the black cotton soil tracts for the following reasons:—

- (1) In years of average rainfall the soil is more suitable for the raising of dry crops. The raising of dry crops is not attended with the trouble and expense necessary for raising crops by irrigation; and the rate of assessment charged being low, the rayat naturally is not inclined to take to irrigation.
- (2) Another reason is the difficulty of getting sufficient manure for the entire area of his holding.
- (3) The third and the most important reason is that the rayats in the black soil tracts are not accustomed to raise monsoon and other non-perennial crops by irrigation. Their general idea being that irrigation should be resorted to only for

rice and perennial crops such as sugarcane and plantains. It is a question whether the canals would give sufficient supply for perennial crops in years of short rainfall. The Dharma Canal in the Dhárwár District failed to supply water for the irrigation of rice in the lands commanded by that canal.

137. Q. The soil does not become clayey and cake?—If a sufficient quantity of manure is put down and if the land is allowed to lie fallow for sometime the salt efflorescence will not affect it.

138. Q. Otherwise it would affect it?—Yes.

139. Q. Does not black soil crack?—Yes, black soil generally cracks.

140. Q. If it was irrigated, would not these cracks absorb a great deal of water?—It requires a heavy rainfall to fill up these cracks.

141. Q. Do you think that on account of the soil getting muddy and clayey it would be difficult to work properly?—I think so.

142. Q. (Mr. Ibbetson).—In the case of a *bania* who lends money for wells, I suppose the rayat gives the *bania* a considerable portion of the crop each year?—He does.

143. Q. If he did not do that the *bania* would cease to advance money?—Generally the object of the sowkar is to get interest, it is with that view that they give advances.

144. Q. I suppose if the rayat left off making payments of crops on his running account the sowkar would take steps to recover his money?—Yes, he would.

WITNESS No. 69.—MR. KRISHNAJI BALLAL BHIDE, Mamlatdar of Bagalkot.

Answers to printed questions.

I.

Mr. Bhide.
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Yes, they do; but new tanks for two or three years after construction or until the floor becomes consolidated do not hold sufficient quantity of water. Black soil dams could not be raised of more height than 10 to 12 feet except puddling. Stone-pitching is generally necessary up to the high-water mark inside the dams in order to stop clods of earth falling into the tank. The demand for water increases in the drought, but it also exists in case of average rainfall. Of late years, for reasons unknown, the rainfall has become scanty and variable. It does not fall seasonably. In this tract it is quite enough for agricultural purposes if it rains 6 to 7 inches from June to August and an equal quantity from September to the end of November. In a year of seasonable rainfall splendid harvests are reaped and after a good year a rayat could lay by even for the following year, paying the Government dues easily, which are not high. The owners raise owing to paucity of funds small dams in their black soils to hold the rain water as far as possible, and if tanks are constructed they would be remunerative.

A well with two (*mots*) water-lifts ordinarily irrigates 7 wells, 8 acres of land, except in years of drought when only it irrigates half the above area. The rayats in this part would prefer tank irrigation to that of a well, as the cost of construction (Rs. 800 to Rs. 1,000) and the bailing of water from the depth (50 feet) entail heavy expenditure. About 50 per cent. is paid generally by Government in the way of *takavi* for the construction of a well. A rayat spends the remaining sum out of his own pocket if he is a well-to-do man. In some cases it is noticed that a well has remained half finished for want of funds. The concession in this respect is that the assessment is not increased during the currency of the present settlement. If a rayat digs to the depth agreed upon and fails to get water at that depth, Government should immediately give him the sum required to complete his well on his personal or other security. The interest charged is not high and one could not get money at such a low rate of interest as 5 per cent., however solvent the security may be. At present the Collector allows ordinarily ten instalments of the loans granted both for wells and dams. In order to stimulate well-irrigation the period of repayment may be extended to 20 in all cases of loans, except where the rayat himself agrees to repay earlier. Owing to successive droughts most of the wells ran dry, and they were deepened by taking out silt. But as they did not supply sufficient quantity of water, two or three holes were bored at the bottom with long iron crowbars until they reached the water strata in the sub-soil. The water tapped through these holes lasted throughout the drought for irrigation, and enabled a rayat with his family and

bullocks to pull through the drought without going to a relief work. To enable the prompt payment of *takavi* separate establishment with proper supervising agency might be created. It should move from village to village inspecting old works and examining new projects and issuing cheques on the Táluka sub-treasury for payment of the loans required.

8. Drainage works.

No drainage works are required in this part of the country.

The only irrigation work in this táluka is a tank in the village of Muchkundi. Ordinarily it irrigates 110 acres of land. The water rate for the

perennial crops is Rs. 8. A project of constructing a tank at Kalaskop near Kaladgi is under consideration. No systematic programmes exist for irrigation works. Famine relief was required in all its forms in the villages submerged by the Muchkundi Tank owing to the failure of water in the tank.

II.

A.—General.

Question No. 1.—To the Bagalkot Táluka of the Bijápur District. I have served both as Mamlatdar and District Deputy Collector during the past two years and a half in the Bijápur District.

No. 2.—The average rainfall of this táluka is as shown below:—

Months.	Rainfall.	Months.	Rainfall.
	Inch. cts.		Inch. cts.
January . . .	0 1	July . . .	1 54
February . . .	0 31	August . . .	0 90
March . . .	0 6	September . . .	6 22
April . . .	1 73	October . . .	2 77
May . . .	1 86	November . . .	0 85
June . . .	3 41	December . . .	...

No. 3.—Except Nos. 5 and 6 my replies to others are in the negative.

No. 5.—Yes; the loans are freely taken. For the construction of a well the sum advanced generally falls short of the requirement under the existing practice. I have seen many a well constructed out of takavi half finished owing to want of capital. It usually happens that an advance is made up to 20 times the assessment of the land offered as security; but it does not answer the purpose in question. Moreover, a rayat can get more money on the security of his said land by going to a sowkar. I would therefore suggest that sufficient money required to sink a well may be advanced on the security of land taking into consideration its market value in a favourable season. I would also suggest the remission of the money spent in case of the failure to obtain water and the extension of the period of repayments from 10 to 20 where necessary.

D.—Tanks.

- No. 23.—(1)—By rain water.
(2)—By small water channels.
(3) (a)—Two years.
(b)—One year.
(c)—Four months.

E.—Wells.

- No. 34.—(1)—Fifty feet.
(2)—There are very few springs in the sub-soil and water is generally obtained by percolation. The percolation supply runs short in a year of drought.

- (3)—Rs. 800 to 1,000.
(4)—Fifty years.
(5)—By water-lifts called mots.
(6)—Eight acres.
(7)—Eight acres.

No. 35.—Irrigation increases the value of the produce of the land by twofold by rendering it possible to cultivate two harvests instead of one. In a year of ample rainfall the yield would be double, and in a year of scanty rainfall it will be what it would have yielded in a year of average rainfall without irrigation, and in a year of drought one-fifth of the ordinary year.

- No. 36.—(1)—Rs. 50 per acre.
(2)—Rs. 10 per acre.
No. 37.—(1)—Rs. 25 per acre.
(2)—Nil.

These rates are paid on the total area attached to a well.

No. 38.—(1 and 2)—No difficulty is encountered either in the selection of sites for wells or in their construction.

No. 39.—I am not in favour of the construction by Government of wells in the land which is private property as it would entail a heavy expense.

No. 40.—Temporary wells are not used in this district.

1. Q. (*The President*)—You are Mamlatdar of Bagalkot?—Yes.

2. Q. How long have you been in that place?—For the past six months only; before that I was District Deputy Collector for two years in charge of Indi and Sindgi talukas of this district.

3. Q. Have you seen a great deal of black cotton soil in this district?—Yes.

4. Q. Do they make wells in it or not?—Not in very black soil.

5. Q. Why?—Because there is no water strata or springs at the bottom.

6. Q. Wells don't pass through rock in this district?—No.

7. Q. They merely go down to the soil?—Yes, there is first black soil, then *muram* and then rock.

8. Q. Sometimes the black soil is so deep that they don't go through it at all?—Yes.

9. Q. In that case wells do not succeed?—No.

10. Q. You say that a well with two mots ordinarily irrigates eight acres of land except in a year of drought when it only irrigates half that area. What is the reason for that; why should it go down as much as half?—Because the level of water goes down, consequently it is very troublesome to raise water.

11. Q. Does a well often run dry altogether?—In a year of drought it does, but in ordinary years it does not.

12. Q. Does not a cultivator use greater economy in regard to water in dry years?—He irrigates only a small area in such years.

13. Q. You say "about 50 per cent. of the cost of a well is paid generally by Government by means of takavi for the construction of wells." Would the rayat not have to go to the sowkar for the difference?—He would not get it as he has mortgaged his own land for the takavi and would find it very difficult to get money from the sowkar.

14. Q. You propose that Government should give the sum required to complete the well?—Yes.

15. Q. Do you think a number of wells are left uncompleted?—Yes; nearly one-fourth.

16. Q. They are not used?—No. Either the site chosen was a bad one, or they may not have had sufficient funds to complete the well.

17. Q. Do you think that it is desirable that there should be extension of wells in the country for the good of the people?—I do.

18. Q. What would you recommend as the best means to protect the country in case of another famine occurring?—Instead of wells the rivers should be bunded up to stop the water from running into the sea; and large irrigation tanks should be built after making careful irrigation surveys.

19. Q. Suppose that is found too expensive, then you would recommend the construction of wells?—No, not in the black soil.

20. Q. Then what about the people who live in the black soil areas?—They would have to leave their villages.

21. Q. If you make bunds on the rivers and the rivers run dry then the bunds will run dry?—We could keep a supply of water in the reservoir for two years.

22. Q. Then you must have reservoirs?—Yes, we must construct a tank that will store a two years' supply at least.

23. Q. You have one such tank—the Muchkundi—on which apparently a good deal of money was spent, but it irrigates only 40 acres?—About 100 acres.

24. Q. Well, even that is not encouraging?—No, not at all.

25. Q. What do you think is the reason of that?—It does not hold a sufficient quantity of water.

26. Q. We were told that every year water is left in it and that the people never use all the water?—That is the case, but if water was available regularly they would use it.

27. Q. Are you satisfied about that?—Yes.

28. Q. The tank is in your taluka?—Yes.

29. Q. (*Mr. Muir-Mackenzie*)—How many years have you been there?—Only for six months. I was Chitnavi here for two years and then District Deputy Collector.

30. Q. Were you not there before 1896-97?—No.

31. Q. In 1895-96 where were you?—In the Karwar District.

32. Q. (*The President*)—Could you give me any reason as to why the people are using the Muchkundi tank so little?—They do not use it because the supply is uncertain.

33. Q. Do you think that the period of repayment for takavi ought to be extended to 20 years?—Yes.

34. Q. Could you tell us why the full limit allowed by law is not allowed?—It is not the practice. I cannot say why.

35. Q. Everybody seems to think it ought to be done, but nobody does it?—No.

36. Q. Do you think it would be a good thing if Government gave takavi freely for wells?—Yes; there could be no harm in that.

37. Q. Do you think it would induce people to make wells?—Yes.

38. Q. You would recommend it for the black cotton soil country?—No.

39. Q. What do you propose to do there?—Nothing is possible there.

40. Q. (*Mr. Ibbetson*)—Suppose you gave them canal water, what then?—They would use in bad times.

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41. Q. Only in bad times?—Yes, in ordinary years they can do without water.

42. Q. (The President)—In what part of the country is the proportion of black cotton soil the greatest?—In the eastern portion.

43. Q. Not in the western parts?—No.

44. Q. (Mr. Ibbetson)—In this black soil what crop do they grow?—They grow cotton, rabi, juari, gram and wheat.

45. Q. Mostly?—Rabi, juari and wheat.

46. Q. Not mostly cotton?—No.

47. Q. You say in your note that when a man has made a well from his own money the concession is that assessment

is not increased during the currency of the present settlement?—Yes.

48. Q. What happens at the revision of settlement?—The improvement is taken into consideration and the assessment is increased.

49. Q. He gets enhanced assessment on account of it?—Yes.

50. Q. (Mr. Muir-Mackenzie)—Don't you know that the provisions of the Land Revenue Code expressly lay down that the improvements of rayats should not be taken into consideration in making a revision of the settlement?—There is to be no increase during the currency of the settlement only.

51. Q. No increase even at the revision of settlement?—I did not know that.

WITNESS No. 70.—MR. RAMCHANDRA HANMANT BEVUR, Mamlatdar of Indi.

Answers to printed questions.

Mr.
Bevur.

1. § 1.—The answers below refer to the Indi taluka in the District of Bijapur. I have been Mamlatdar of this taluka for nearly three years, and I have had many opportunities of being acquainted with the taluka.

2. § 2.—The rainfall for the last nine years is as follows, there being no record thereof before 1892:—

Years.	Inches.
1892	47.65
1893	40.7
1894	21.66
1895	27.35
1896	13.33
1897	22.57
1898	24.45
1899	12.35
1900	16.53

The decrease from year to year is worth noting and the question of the reservation of some areas for the growth of trees, which attract clouds, may be considered.

The average monthly rainfall for the last nine years is as follows:—

Months.	Inches.
January . . . . .	.02
February . . . . .	.036
March . . . . .	.38
April . . . . .	.73
May	1.29
June	2.54
July	3.05
August	3.16
September	7.84
October	4.38
November	0.73
December	0.0

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3. § 3.—There is no obstacle to the extension of irrigation arising from—

- (1) sparsity of population;
- (2) insufficient supply of cattle; or
- (3) insufficient supply of manure;

but there is some obstacle on account of—

- (4) the unsuitability of the black soil to irrigation;
- (5) the uncertainty of the supply of water;
- (6) lack of capital; and
- (7) fear of enhanced revenue.

4. § 4.—Under the present law (Section 107, Bom., L. R. Code) assessment cannot be increased on account of improvements effected by private capital. Tenants scarcely undertake any work of improvement at their own cost, there being no tenants of permanent tenure in this taluka.

5. § 5.—Loans under the Land Improvement Act are freely taken by the people for the construction of wells and the erection of large dams.

I am not in favour of—

- (1) reduction of the rate of interest, or
- (2) remission of interest;

but I recommend partial or total remission of advance in case of partial or total failure of the attempt to obtain water. The present rules are sufficiently liberal as regards the period of repayment, which can be extended up to ten years by the Assistant or Deputy Collectors.

I cannot recommend any grant-in-aid as people will attach very little importance for such small money rewards. The only encouragement that occurs to my mind is that if any landholder constructs any canal or well so as to irrigate a certain area, about one-tenth of that area may be declared as his Inam with or without a fixed jodi. It is said that in old times the Rajahs of Mysore had made it a rule that anybody might construct any irrigational works anywhere, and he would get one-tenth of the area thereby irrigated as his Inam; and the above suggestion is based on this tradition.

6. § 6.—Extension of irrigation is not at all likely to injure the remaining cultivation by attracting its cultivators.

People do evince a strong desire to have the means of irrigation increased.

B.—Canals of continuous flow.

7. § 7.—There is only one canal of continuous flow in this taluka. By erecting a temporary dam across the Indi Nala water is diverted to the canal which is about a mile in length, and it irrigates 17 fields of an aggregate area of 116 acres. In this irrigated area two harvests are generally cultivated. Generally there is no difference in the yield in a year of ample rainfall or in a year of ordinary rainfall, for the increased water cannot rise to the ordinarily unirrigated portion of the lands. But in a year of drought the yield is reduced by nearly half or sometimes more.

8. § 8.—The approximate increase of produce per acre due to irrigation can be estimated at—

- (1) three times the ordinary produce of a normal year of ordinary rainfall;
- (2) twice the ordinary produce in a year of drought.

Generally an acre of such land when not irrigated produces about 4 bags of corn, generally juari, but when irrigated produces about 12 bags of wheat or paddy; and in a year of drought the yield would be about 8, instead of 12 bags. Money value cannot be given as the same depends upon the prevailing prices of the different kinds of corn.

9. § 9.—This Indi Canal is owned by the owners of all the 17 lands jointly, and when any land is let to tenants a fixed rent is levied. The tenant now pays a rent of about Rs. 12 per acre, while if the land were not irrigated he would have paid Rs. 3 per acre; thus the increase of rent is Rs. 9 per acre due to the canal.

Ordinarily lands of the same soil as these are assessed at Re. 1 per acre, but these lands on account of the irrigation advantage are assessed at Rs. 6 per acre. Thus the enhancement of revenue is Rs. 5 per acre.

The enhanced revenue is fixed once for all on the whole irrigable area in each survey number at the time of the last Revision Settlement.

10. § 10.—The annual cost of repairing the canal (which is not in any way built) comes to about Rs. 100 or Re. 1 per acre of the land irrigated. This expenditure is borne by all the owners of the irrigated lands in proportion to their areas. To prepare the land for irrigation about three times the cost of a dry-crop land is necessary. The enhanced expenditure may be approximately estimated at Rs. 3 per acre. When the land is worked by a tenant he incurs this increased expenditure, and this fact is taken into consideration when fixing the annual rent.

11. § 11.—The water in the canal is never too profuse to cause any damage whatever.

C.—CANALS OF INTERMITTENT FLOW.

12. §§ 12—19.—There are some small canals in the villages of Horti, Halguniki and Kolurgi, which run about six or eight months of the year. They are worked and used on the same lines as described above. The increase of assessment is Rs. 2-8-0 and that of rent is Rs. 4 per acre. The total area irrigated in the three villages is about 100 acres.

13. § 20.—The cost of repairing the canal is about four annas per acre. The canals are too small to require any legislation.

14. § 21.—The canals in these villages as well as in Indi are constructed by private persons. Scarcely any difficulties arise in the distribution of water as hours are fixed for each of the lands under the command of the canal. It has never been found necessary for Government to take over the management of these canals.

15. § 22.—In this taluka there are very few sites suitable for the construction of further small canals by private persons. Large projects however are possible in some places which must be undertaken by Government as they are likely to cost very large sums. I enclose herewith a statement* of suggested large irrigational projects, which I once submitted to the Collector.

D.—TANKS.

16. §§ 23—33.—There are no tanks in this taluka.

E.—WELLS.

17. § 34.—In this taluka—

- (1) the average depth of permanent wells is 40 feet;
- (2) the supply of water is generally from springs and it is liable to fail in a year of drought only. The water never becomes saline.
- (3) The average cost of construction of a well is—
 - (a) Rs. 300 in the case of a *kachcha* well, and
 - (b) Rs. 700 in the case of a *pakka* masonry well.

1. Q. (The President).—You say in paragraph 5 of your memorandum "I am not in favour of (1) reduction of the rate of interest, or (2) remission of interest, but I recommend partial or total remission of advance in case of partial or total failure of the attempt to obtain water." Do you think the present rules are sufficiently liberal?—They can be extended up to 20 years, in practice they are extended only to ten years, generally 20 years is not given.

2. Q. Twenty years ought to be given?—Yes.

3. Q. You say again "there is only one canal of continuous flow in this taluka. By erecting a temporary dam across the Indi Nala water is diverted to the canal, which is about a mile in length, and it irrigates 17 fields of an aggregate area of 115 acres." That is a temporary *bandhara*?—Yes.

4. Q. Is there only one of these *bandharas*? Why don't the people make more?—There is only one.

5. Q. Is there any reason for that; is the whole of the water taken up?—The whole of the water is taken away, but since re-appears below the bund.

(4) A *kachcha* well lasts for about 50 years if care is taken to repair it every year, and a *pakka* well may last for about 100 years. Wells are often liable to be damaged in case of very excessive rainfall.

(5) Water is raised by *môt*.

(6) The average area commanded by a well is about six acres.

(7) The average area irrigated in any one year by a well is about five acres.

18. § 35.—By *môt* irrigation two harvests can be cultivated and also more valuable crops can be substituted for the less according to the convenience of the cultivator. On this account the value of the produce is increased to three times the dry-crop produce.

The yield also increases—

(a) to three times the quantity in a year of ample rainfall;

(b) to two times in a year of scanty rainfall; and

(c) in a year of drought about 25 per cent. less than the ordinary dry-crop produce.

The cost of working *môt* is rather heavy. In a year of drought wells are often liable to fail and are required to be cleared of the silt or deepened if necessary which also costs a substantial sum.

19. § 36.—(Vide paragraph 8 above).

20. § 37.—(1) The tenant pays about Re. 1 per acre as the extra rent on account of well-irrigation. (2) The Government assessment is not generally increased on account of well-irrigation.

21. § 38.—No serious difficulties are encountered—

(1) in the selection of sites for the wells, or

(2) in the actual construction thereof.

No assistance in any shape whatever has ever been offered by Government or local bodies to the people in the construction of wells. The only assistance the people would require is in the selection of a spot where the required supply of water would be obtained, and this can be done by the appointment of an expert officer for the district.

22. § 39. I am not in favour of the construction of wells in private lands by Government for various reasons. The construction of a well by Government costs a far more heavy sum than what would be incurred by a private person, who would therefore be very much reluctant to bear the burden thereof. The Government officer in charge of the work and the owner are not unlikely to be in conflict as regards the shape, size, etc., of the well. People have some superstitions of their own, and the officer would not readily accede to their wishes in all minor particulars.

23. § 40. Temporary wells called Budkis are sunk in the beds of nallas and used for growing some fodder or other crops. They are a very small protection against drought. Wherever possible people sink such Budkis and no encouragement is needed. In this taluka sites suitable for such Budkis are very few.

6. Q. Have you any other rivers in your taluka?—Yes, the Bhima; 23 villages are situated on the river.

7. Q. You say there are some small canals in the villages of Horti, Halguniki and Kolurgi. What river are these upon?—They are small streams, simply nallas, they have small temporary *bandharas*; since 1896 water has very seldom run through the canal and very small areas have been irrigated from these streams. I find that in 1895-96 there were 100 acres irrigated, in 1896-97, 80 acres, in 1897-98, 119 acres, in 1898-99, 103 acres, in 1899-1900, 88 acres and in 1901 there were 113 acres.

8. Q. This one *bandhara* takes off the whole of the water?—Yes, but some water comes out by percolation.

9. Q. You say in paragraph 15 "in this taluka there are very few sites suitable for the construction of further small canals by private persons. Large projects, however, are possible in some places which must be undertaken by Government as they are likely to cost very large sums." In saying that have you any places in your mind's eye?—Yes, please see list * accompanying my memorandum.

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10. Q. Have you discussed these at all with the Executive Engineer?—No.

11. Q. How long have you been in this taluka?—Three years, I was also 3½ years in Indi before.

12. Q. These nalas that you mention on page 7, was there any water in them in these years of drought?—In the hot season there is very little water, if *bandharas* are built the water will remain.

13. Q. Will it be worth while to build *bandharas* there?—Yes, because some lands are sure to be irrigated.

14. Q. This Indi canal is managed by the people themselves?—Yes.

15. Q. Do you think if Government built *bandharas* on these streams that the people would arrange the irrigation?—Yes.

16. Q. In places where there are no nalas, what do you do?—So far as Indi is concerned, it is full of nalas. If the flood water of all the nalas was availed of the taluka would be protected to a great extent. Sluice gates may be constructed on rocky edges of nallahs and the river through which inundation water might run to tanks kept ready previously excavated; and these tanks can irrigate the lands around in winter and summer.

17. Q. Have you any figures of the irrigation on the nallahs in these years of drought?—No.

18. Q. How long would water remain in these nallahs that you have mentioned here in a year of drought?—I think about five or six months.

19. Q. Up to March?—It will accumulate in the rainy season and last for five or six months.

20. Q. Have these nalas water in them now?—Some are running.

21. Q. (Mr. Higham.)—You speak of dry stone dams, how do they hold water?—The walls are built of dry stone with mud.

22. Q. Does the water leak through?—Not if it is sufficiently thick, there are masonry ducts in the middle to allow the water to go through.

23. Q. When were these made?—About 40 years ago.

24. Q. When did they breach?—About 20 years ago.

25. Q. How have you ascertained that?—From what I have heard from the old people of the village.

26. Q. I suppose they had no waste-weir?—The reason of its being breached is owing to the waste-weir being too small or to excessive rain.

27. Q. Do you know of *bandharas* having been built by private parties since the last settlement?—No.

28. Q. None are being built now?—No.

29. Q. Are there any places in which they might be built?—Yes on these small nalas they could be built.

30. Q. Why don't they build them?—It would not irrigate one field only, but some others, and combination is not possible among the *rayats*.

31. Q. They used to combine to build them, they combined to build those you spoke of—the Indi Nala?—That has become a custom among the Indi people as the *bandhara* has been existing since over a hundred years; they do combine now to renew it; but it is only a temporary *bandhara* constructed every year after the rains.

32. Q. Then the other works that you mention are also built by private people?—They only irrigate a few fields.

33. Q. Do you think the people used to combine and that they cannot combine any longer?—It appears so.

34. Q. What is the reason of that?—Each thinks himself wiser than the other. No particular reason can be assigned for this.

35. Q. Supposing they did make the *bandharas*, what would they have to pay in the way of water-rate?—According to the quantity of the water, the rate would range from Re. 1 to Rs. 4 an acre.

36. Q. Would that be a water-rate?—Yes, additional assessment.

37. Q. (Mr. Ibbetson.)—The Indi people pay Rs. 5?—Yes, a consolidated assessment of Rs. 5 per acre.

38. Q. (Mr. Higham.)—Supposing they hadn't to pay anything to Government for making a *bandhara*, do you think they would make it then, and would it induce them to combine?—Yes, but they would have to be pointed out the site of the *bandhara* and the position of the canals.

39. Q. (Mr. Ibbetson.)—You say in your note that in your taluka "tenants scarcely undertake any work of improvement at their own cost, there being no tenants of permanent tenure." Do you think there are many tenants who would undertake works of that sort, if the law protected them?—Yes.

40. Q. Do you think many of them are sufficiently well off?—Yes, there are a few, not many.

41. Q. Supposing that apart from the permanent tenure, the law secured a tenant for a certain time till the value of his improvement was worked out, would that be sufficient, do you think?—It would not be sufficient unless he had a permanent tenure.

42. Q. You say that you would not extend the period of repayment beyond ten years, do you think ten years is enough?—It may be extended to 20 years.

43. Q. You say in your memo, regarding the construction of wells "I cannot recommend any grant-in-aid as people will attach very little importance to such small money rewards." Supposing Government said to the people of a very bad tract in the district, "if you make a well, costing Rs. 800, we will give you the whole and will only recover Rs. 400, the other Rs. 400 being a free gift." Would that be an inducement to them to build wells?—Yes.

44. Q. Would that not be a great inducement?—Yes.

45. Q. You did not refer to that when you said you would not recommend a grant-in-aid?—No.

46. Q. You say "the only encouragement that occurs to my mind is that if any landholder constructs any canal or well, so as to irrigate a certain area, about one-tenth of that area may be declared as his *inam* with or without a fixed *judi*." Has that been tried?—No.

47. Q. Will that in your opinion be an inducement?—Yes, it will go to their posterity.

48. Q. Have you had any experience of an arrangement of that kind in Native States?—No.

Mr. Rajaratna Mdlr. explained that Government relinquishes dry assessment on one-tenth of the land, but takes wet revenue on the remaining area.

49. Q. You say on page 4 "the average area irrigated in any one year by a well is about 12 acres." How many *mot*s would that be?—Twelve is a mistake, it should be five or six, there would be one *mot*.

50. Q. Would one *mot* irrigate five or six acres?—Yes.

51. Q. Do you mean that they would work half in the *kharif* and half in the *rabi*?—There will be no difference, six acres would be under irrigation at the same time.

52. Q. How long have you been in this district?—I have been here these three years, before that I was here for three years.

53. Q. What happened to the wells in 1896-97, did they fail much?—I was not in this district at the time.

54. Q. In 1899-1900 did they fail much?—Yes.

55. Q. When did they begin to fail?—In January.

56. Q. Did they get worse and worse?—Yes.

57. Q. Were they worse next year?—Yes.

58. Q. And worse still this year?—Yes.

59. Q. Now this year what proportion of the ordinary area will they irrigate?—Only about half.

60. Q. So that the failure in the first year was not a large proportion?—No.

61. Q. Would they irrigate four-fifths?—Yes, one-fifth failed in the first year.

62. Q. And one-half after three years?—Yes.

63. Q. (Mr. Rajaratna Mdlr.)—You said there is difficulty in inducing *rayats* to combine to construct a *bandhara*; supposing that a capitalist is allowed to levy a water-rate on lands belonging to other *rayats* for water supply from the *bandhara*, will that be sufficient to induce them to construct *bandharas*?—Yes, that will be an inducement to some extent, the sowcar or capitalist will induce them to take water to ensure his water rate.

64. Q. Supposing he levies the usual water-rate from other people and that his own payment to Government is reduced to one-half or one-third, will that act as a further inducement to construct *bandharas*?—Yes.

65. Q. (The President.)—Cannot the Mamlatdar induce them to combine just as well with a little persuasion, why do you require to get the sowcar in?—In some cases it is possible; the selection of the sites must be made by expert officers; if once it is constructed, they will combine.

66. Q. (Mr. Rajaratna Mdlr).—How large an area will be brought under irrigation if all the nallahs in your taluka are fully utilized?—About 80,000 to 40,000 acres if all the nallahs were utilized; the flood water could also be availed of to some extent.

67. Q. How high is the *kachcha* bund on the Indi?—About four to five feet high.

68. Q. You say in paragraph 20 "The Government assessment is not generally increased on account of well irrigation." Some people fear that the assessment will be increased?—Enhancement of assessment depends on prices, it is possible that the assessment will be raised to some extent.

69. Q. (Mr. Muir-Mackenzie).—In your taluka there are a great many *tals*?—Yes.

70. Q. Do you think a great many more might be made?—Yes.

71. Q. Do you think they are beneficial?—Yes.

72. Q. In what way?—They are generally on the slope of the fields and water accumulates inside these *tals*, besides which mud silts there and a good crop results.

73. Q. Is there a crop even in a year of drought?—Yes; a good crop wherever the water accumulates; this year we have a good crop behind these '*arnis*' the special term of this taluka for '*Tals*.'

74. Q. You were in the taluka during the famine?—In this famine, not in 1896.

75. Q. What were the people chiefly employed on?—Most of the people left the district and went to other places.

76. Q. Were there any famine relief works?—Yes; the Saugogi tank work.

77. Q. Would it have been a good thing to employ them on making bunds and *tals* or *arnis*?—The *arnis* have to be built on private lands, and it is not possible for Government to build them.

78. Q. Why?—The owner might have his own way of building them, and the two agencies might not agree.

79. Q. Do you think the owner would object?—Yes.

80. Q. I don't mean that the owners have to pay if Government build it?—Then they will agree, people have superstitions as to the direction in which to construct the works and the day of the week to begin, but such slight difficulties could be got over.

81. Q. There is not much black soil in your taluka?—No.

82. Q. Only on the bank of the river?—Yes, and in the eastern side of the taluka around the village of Tambe.

83. Q. Wells are mostly sunk in *muram*?—Yes, and in white soil also.

84. Q. Have you found many disused wells in your taluka?—Yes.

85. Q. When were they made?—About 50 or 100 years ago; they have been allowed to lie unrepaid as they got damaged by excessive rain and the rayats could not rebuild them, in the famine such wells were utilized when the rayats could get money to repair them.

86. Q. Very often then a disused well might become useful in a year of famine?—About 25 per cent. of the disused wells came into use in this famine.

87. Q. Have you ever heard that rayats object to take *takavi* on account of the rigidity of its collection?—There are very few who are reluctant to take it; in a good year they may not be so ready to do so and some concession should be allowed.

88. Q. What concession?—The attachment of movable property should not be taken in hand for at least six months after the date of default and one year in the case of immovable property; one year might be allowed before his land is attached for payment of *takavi*. To ensure prompt payments of the advances, the Mamlatdar may be authorized to sanction *takavi* up to Rs. 200 or Rs. 500. If the Mamlatdar can sanction *takavi* up to Rs. 200 for seed and cattle, as is the case now, there is no reason why he should not sanction up to the same amount for land improvement.

89. Q. You don't think that instalments should be longer?—They might be extended up to 20 years.

90. Q. You say the present rules are sufficiently liberal?—They could be extended up to 20 years, but ten years has become the practice.

91. Q. What is the reason that it has become the practice?—I don't know there may be some old orders on the point.

92. Q. (Mr. Ibbetson).—Beyond ten years, do you send to the Collector?—Yes.

93. Q. You can sanction up to ten years yourself?—The Assistant Collector can do so, the Mamlatdar has no power to sanction *takavi* for land improvement.

WITNESS No. 71—MR. DASO BALWANT BETIGERI—Mamlatdar of Hungund, Bijapur District.

Answers to printed questions.

I.

3. Small tanks constructed in black soil will certainly hold water if the soil is dug out 15 feet deep and an earthen dam of sufficient width is put up. The dam of course should have a core wall of dry stone inside and the other side of the dam should be lined with a thick layer of *muram*, or else the dam will be washed away by the force of the water current. No masonry wall is required, save the inlet and the sluice, which should be of masonry work. But there is one great defect in the tank of the black soil. It is generally silted up very quickly. The silt will have to be removed every decade of years and with this recurring expenditure the tank will be a success. Of late the rainfall is said to have been scantier every year compared with the fall before twenty years back. Assuming that the average rainfall is good there is not much demand for water for ordinary dry crop. If water be made available people will not only make use of it in prolonged drought, but also for growing garden crops, which will only be grown by irrigation even in favourable years, because the garden crop is much more paying and profitable than the dry crop. In the case of black soil the demand for water is never slack even though the rainfall be very good and the revenue will never be precarious on account of the falling off of the irrigated area. Owing to apathy and slovenliness on the part of the cultivators in this taluka they were content with whatever the lands used to yield, and the land was generally yielding a bumper crop as the rainfall was plentiful and seasonable in good old times. But series of failure of crops since the great memorable famine of 1877 has stimulated the cultivators to devise and carry out all possible agricultural improvements, and the conversion of the dry crop into garden crop land is considered to be the best and safest improvement. It will therefore be seen that there will certainly be as much demand for irrigation in black soil, and the construction of tank for black soil is considered as

remunerative and as important as for other classes of soil. The irrigational prospects in lands which are mostly black soil under the command of the Gokak Ghataprabha canal will bear me out. I may also add that a greater area of irrigated land under the command of Mugad Tank in Kod Taluka and Dharma canal in Hangal Taluka in Dharwar Collectorate is black soil. From my own personal experience I may say that the part where Ghataprabha canal in Gokak Taluka now runs was constantly liable to famine. But since the opening of the canal famine is not heard of there.

7. Yes. It is both possible and desirable to stimulate the construction of new wells by more liberal advances and inducements. The only practical inducement I can suggest is to make advance without interest. Owing to the long drought I am told about a dozen of wells ran dry and have been deepened, of which I have seen five and found in them a sufficient supply of water. I have not come across with any instance in which an old well which ran dry was deepened and abandoned for want of water, but I have seen two new wells which were dug up and abandoned as the water was not struck and the further excavation was likely to entail considerable expenditure which the owner was unable to provide. Average depth of water below surface in this taluka is 45 feet, and the cost of the well varies according to its size and the quality of sub-soil and the distance at which stones are obtainable. On an average the cost is about Rs. 800. Generally the part of the well below the pulleys to draw water from is constructed in this taluka with stone and mortar and the other part of the well with dry rubbles only. The average area served by each well with one *mot* and one pair of bullocks is three acres.

8. The tract in this taluka having been almost plain, crops are never heard of as having been injured by water-

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logging or excess of water in very wet years. Drainage works are therefore not required on agricultural grounds. Small pits dug out for depositing manure adjacent to the village site are seen in some villages. Water stagnates in these pits which are objectionable on sanitary grounds, but such nuisances can be put a stop to by the adoption of vigorous measures under the Police Act. No drainage works are therefore required even on sanitary grounds.

10. The relief works entered in the famine programme that have been executed during the last famine may, I think, be maintained in good order; otherwise large outlay incurred by Government during the famines will be deemed to have been wasted. I do not think it necessary for extending or completing the works entered in the programme until the next famine. But I would respectfully suggest the insertion, as a large relief work, of the Balkundi Nala. My proposal on this work will be submitted next month after visiting the work once more.

14. No large irrigation work was constructed either by Government or by public with the aid of tagai advances during the famine of 1897. No information required in this paragraph can therefore be given.

II.

A. - GENERAL.

1. The foregoing answers belong to the Hungund Taluka, Bijapur District. As a District Inspector of Agriculture for about two years in this District and as a Mamlatdar of the Taluka for two years and as an owner of land irrigated by canal water and well water in Gokak Taluka, I have had the opportunity of making myself acquainted with the subject and the taluka.

2. The average rainfall for the past five years as compared with that for five years previous to them is given in the subjoined table:—

Month.	Average rainfall from 1892 to 1896.		Average rainfall from 1897 to 1901.	
	In.	cents.	In.	cents.
January . . . . .	.....		0	.....
February	0	50	0	19
March	0	88	1	41
April	1	87	1	87
May	1	37	1	23
June	1	55	3	69
July	3	39	1	9
August	3	48	1	20
September	4	96	8	33
October	4	10	3	38
November	1	12	0	92
December . . . . .	.....		0	1
TOTAL	21	36	22	34

3. (1) The total area of the taluka is 520½ square miles and the total population according to census of the current year is 83,615 as compared with the census population of 102,894 for the year 1891. Owing to series of droughts for the last five years many have emigrated to the Nizam's territory. Some have returned after the census and all the remaining persons will return if the prospects of the season promise to be good. The population consists more of agriculturists than other classes. I do not therefore think that the agricultural population is sparse in the taluka.

(2) There are 12,654 heads of plough cattle in the current year as compared with the number of 20,057 in the year 1895-96. The decrease is due to series of droughts from 1896-97. The cultivable area for the last year was 288,112 acres and the area cultivated 238,406. The ratio of cattle to acreage of cultivated area comes to two bullocks for every 36 acres. The number of plough cattle required for black soil is less than the number required for other classes of soil. Ordinarily two bullocks are sufficient to cultivate 32 acres of black soil and 20 acres of red soil. There are two classes of irrigation, one by drawing water from a well and the other by the flow-water of a canal. In the latter case no bullocks are required to draw water, but two bullocks are sufficient to cultivate 12 acres of irrigated land; while in the former two bullocks are required for every two acres to draw water and cultivate. The area irrigated by well will be far too limited as compared with the area irrigated by canal water. This will show that the present stock of cattle is insufficient. However, this will

readily be increased if the prospects of the seasons be good for four or five years and the good prospects of irrigation be held out to cultivators to boot.

(3) The black soil being generally fertile (the taluka being almost of black soil) it can grow dry-crops without manure. The census of all sorts of cattle for the current year is 35,376, and other animals amount to 30,800. It is roughly estimated that each cattle will yield five cart-loads of manure. Each irrigated acre will require about 50 carts loads of manure. The present produce of manure will on the whole be sufficient for 5,000 acres of irrigated land. The total irrigated area at present is only 554 acres in the taluka. Bone manure and oil-cake manure is not used in this part of the country. When once canal is introduced this manure too will be made use of. So it will be seen that there will not be insufficiency of manure.

(4) The black soil is not unsuitable to irrigation. I can say from personal experience without any fear of contradiction that the soil under the command of Gokak Ghataprabha canal in Belgaum District and the Hangal-Dharma canal and the Mudar and Dumbhal Tank canals in Dharwar District is all black. Rice, maize, sugarcane, chillies, red potatoes, brinjals, garlic, betel-leaves, onions, and sorts of vegetables, the fruit trees, such as plantain, guavas, lemons and coconut trees are grown in abundance in black soil. Mango, apple and other fruit trees which are peculiar to the red soil are not grown in the black soil.

(6) Certainly more capital is required for irrigated crops, both for initial and annual expenditure than for dry crop. I estimate annual expenditure to be Rs. 75 per acre in the case of canal water. The cultivator will manage somehow to bear this expenditure with the sanguine expectation that the outturn of crops will far outweigh the annual outlay.

(7) I do not think that cultivators will shrink from making use of irrigational advantage for fear of enhanced rate, rent, or revenue assessment, because the water-rate will be quite commensurate with the additional profit they receive from the irrigated crops.

(8) The present tenure under the Land Revenue Code does not seem to throw any obstacle in the way of extension of irrigation. But the restricted tenure proposed under the Amendment Act of Land Revenue Code is a great impediment not only to the irrigational improvement, but to all other land improvements. The present Tenancy Law does not create any obstacle to the irrigational improvement.

(9) There are no other reasons against the irrigational project.

4. My office record does not show that any exemption from enhanced assessment for any particular period has been allowed. All I can say from my records is that no enhanced assessment has been levied from Motasthal irrigated land. All Patasthal irrigated land has been levied with the consolidated assessment (land assessment together with water-rate). The present provisions are sufficiently liberal, and I do not think any alteration in the existing law is called for.

5. No. Not so freely for irrigational work as they take for removing weed or throwing an embankment. Firstly, because the well work is much more costly than the sum of tagai they receive in proportion to the security of the land they are able to offer; secondly, on account of the uncertainty of finding water at a reasonable depth. The only practical suggestion I can offer in the way of encouraging the application for loans for the extension of irrigation is the making of trial borings for the people as pointed out in paragraph 38 below. The terms of tagai advance for irrigation should also be made more liberal and enticing, viz. :—

(1) Reduction of interest from Rs. 5 to 3 per cent. per annum.

(2) Remission of interest for the first two years.

(3) No partial remission of advance is necessary.

(4) No total remission need be granted when trial boring is resorted to as explained in paragraph No. 38 below.

(5) The maximum period of repayment allowed under the present rule is 20 years. This period is sufficiently long. But in practice the period allowed does not exceed ten years. If the maximum period be brought into practice, the present period need not be extended.

6. No. Certainly not. When I discussed with the intelligent rayats in my taluka on irrigational matter, they expressed their unbounded joy to see that Government were contemplating some scheme for the extension of irrigation.

B.—CANALS OF CONTINUOUS FLOW.

There are no irrigational canals of this class in this taluka.

C.—CANALS OF INTERMITTENT FLOW.

12. (1) There are a couple of nalas in this taluka the banks of which are not steep. People dig out a small channel of 3 feet width and 2 feet depth from the higher level of the bed of the nala down to a bank, the level of which corresponds with that of the fountain, and the channel is then made to pass downwards through the land by the side of the bank, as will be seen from the following hand sketch.*

(2) Water in the channel constantly runs about a foot high and is used by the adjoining land-owners in turn amicably settled long before. But the area thus irrigated is very small. The total area irrigated by this process amounts to only 163 acres and 35 gunthas in this taluka.

(3) The supply is ordinarily maintained—

- (a) for six months in a year of ample rainfall;
- (b) for four months in a year of scanty rainfall;
- (c) in a year of drought the supply of water falls too short to raise any crop.

13. (a) The supply is not sufficient to grow two crops in a year.

(b) More valuable crops are grown, such as rice, chillies, red potatoes and onions, etc. This is generally the hot weather crop. In the monsoon no such crop is grown. The value of the outturn of this crop is estimated to be double that of the dry crop, but it entails more cost and labour.

(c) The yield is considered to increase in the case of scanty rainfall compared with the yield of dry crop land. This increase may be said to be double. But in a year of ample rainfall and in a year of drought no distinction can be made in the yield of this land and the other dry crop land.

14. As no irrigated crop is grown in the monsoon there is no necessity to reply to this question—(1) and (2).

15. No.

16. The increase in the total annual value of the produce per acre due to irrigation may be estimated—

- (1) at Rs. 5 on the average of normal term of years.
- (2) nothing in a year of drought.

17. The approximate annual rate per acre is as under:—

- (1) Nil.
- (2) Rs. 2-8-0 in the case of rice land and Rs. 3-8-0 in the case of garden land on the area actually irrigated. But this rate varies according to the prospects of the season.
- (3) Rs. 1-8-0 in the case of rice land and Rs. 2-3-0 in the case of garden land on the whole irrigable area.
- (4) Nil.

18. I cannot give what the initial expenditure for constructing this channel would have been, because the channel is said to have been constructed before the introduction of revenue survey.

19. No damage has resulted to the people, but the soil is sure to be deteriorated from irrigation without manure. The supply of water from this channel being hardly sufficient to raise one crop only, there is no danger to the land from the salt efflorescence. Irrigated land adjacent to a big tank is found to suffer from salt efflorescence owing to water-logging, as I have seen in the case of lands close to the old irrigation tank at Asundi in Ranabennur Taluka of the Dharwar District.

20. The channel running through the bed of the nala which is generally five or six furlongs long, requires to be cleared almost every month and that passing through the land once or twice a year. These repairs are done jointly by all the cultivators of the fields irrigated by the channel. I cannot therefore give the cost of the repairs. This system works well and no legislation is necessary.

21. These channels are said to have been constructed by private persons. The channel running from the bank to the irrigated land passes through some other lands which are not benefited by the irrigation. Some trouble might have arisen in the beginning in permitting the channels to pass through those lands, and the owner of the channel might have very likely bought the consent of the owners of those lands. As the area of the channel has been deducted

from the area of the field assessed at the time of the revenue survey no trouble appears to have arisen to the owners of those lands, nor to the realization of dues from them. There is no necessity for Government to take over the management of these canals.

22. I consider it advisable to encourage and assist the construction by private persons wherever possible, although I know that the water-supply is not so ample as in past years. The main difficulty for private persons in undertaking the work is to obtain the consent of the owners of the fields through which the channel is required to pass. This difficulty can only be obviated by acquiring for the applicants the strip of land required for the channel under the Land Acquisition Act.

D.—TANKS.

There are no tanks irrigating the lands in this taluka.

E.—WELLS.

34. The taluka is divided into two main tracts, (1) black soil and (2) red soil.

(1) The average depth of permanent wells is 40 feet in black soil and 30 in red soil.

(2) The supply of water in both the soils is generally from springs and in a few wells which are just on the banks of nalas from percolation. The supply is not likely to fail in an ordinary year, but it does fail to some extent in a year of drought.

(3) The cost of construction varies according to the nature of the sub-soil and the proximity of building stones. On an average the well costs about Rs. 800 in black soil and Rs. 600 in red soil.

(4) If the building be strong and the well circular, it can last for any length of time provided occasional repairs are done to it whenever required.

(5) By a *mot* with two or four bullocks. If the supply of water is abundant and the area to be irrigated is more than two acres, more than one *mot* is used for one and the same well.

(6 and 7) The area commanded by a well depends upon the quantity of water in it. If the supply is abundant three *mots* are used and the maximum area irrigated by three *mots* is not more than six acres. Two acres are ordinarily irrigated by a well of a single *mot* in one year with one pair of bullocks.

35. The irrigation increases the value of the produce by double—

(1) By rendering it possible to cultivate two harvests in one year.

(2) By substitution of more for less valuable crops.

(3) The yield does not increase in a year of ample rainfall, but it decreases to a small extent; while in a year of scanty rainfall and in a year of drought the yield necessarily increases if compared with the dry crop land, which yields nothing in that year.

36. The increase in the total annual value of the produce per acre due to irrigation is estimated to be Rs. 3 both in a year of drought as well as in a normal year.

37. (1) As a rule the tenant of garden land pays to the owner some share of the gross produce of land. This share depends upon the fertility of the land, the supply of water and the competition of the tenants. The share varies from $\frac{1}{4}$ th to $\frac{3}{4}$ th of the produce. The value too depends upon the variety of crop grown. On an average the tenant pays to the owner per acre one rupee more than he would have paid for dry crop land on the area actually irrigated.

(2) No extra assessment or water-rate is paid on account of irrigation by the owner to Government.

38. (1) No difficulties are experienced in the case of lands on the banks of nalas, but in other lands difficulties are encountered in the selection of site.

(2) If the bed of the well consists of hard muram or stone no difficulties are experienced in the construction of the well, but serious difficulties are encountered if the bed consists of sandy land or mud. These difficulties are often overcome by putting a wooden frame at the bottom of the superstructure. This construction is more expensive and is likely to give way after some years.

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No assistance has been given by Government in the shape of expert advice or trial boring, etc. Indeed, such assistance is very useful. There are three Circle Inspectors in this taluka. A boring tool should be kept with each Circle Inspector, who should be taught how to make trial borings, and he should be instructed to make the trial borings in any village at the instance of the Mamlatdar. The Mamlatdar of the taluka should receive applications, and if he be satisfied after enquiry that the applicant is able to undertake the well work and to pay the expenses of the boring if the water is found, he may issue orders to the Circle Inspector to try it. Assistance should also be given in the shape of expert advice. I would suggest that the experts should visit each taluka every year in the summer and encamp in three or four villages in different parts of the taluka to give to those applying for it their advice in the selection of sites and construction of wells. One month's notice of the date and place of their camp should be given so that people may avail themselves of the valuable advice of the experts.

1. Q. (The President).—I believe you are Mamlatdar of Hungund in the Bijapur District; how long have you been there?—Two-and-a-half years.

2. Q. Where were you before that?—Before that I was District Inspector of Agriculture in this district.

3. Q. You are a land-owner in the Belgaum District; have you a large estate?—Yes, I own about 300 acres in the Gokak Taluka.

4. Q. You say in the first paragraph of your note :—" But a series of failures of crops since the great and memorable famine of 1877 has stimulated the cultivators to devise and carry out all possible agricultural improvements and the conversion of dry crop into garden crop land is considered to be the best and safest improvement " then you go on to say " there will certainly be as much demand for irrigation in black soil and the construction of tanks for black soil is considered as remunerative and as important as for other classes of soil." We have heard the opposite view from most people, who say black cotton soil will not take water. In the Muchkundi tank there is water, but the people will not take it?—Black cotton soil if irrigated is profitable.

5. Q. You can no doubt give us the names of places where black soil is irrigated?—I myself have lands with wells in pure black soil, and we get a much better garden crop from them by irrigation. We give black soil water regularly.

6. Q. How deep is the black soil?—The depth is 1 to 1½ cubits.

7. Q. What is below that?—Muram.

8. Q. You say :—" The irrigational prospects in land which are mostly black soil under the command of the Gokak Ghataprabha canal will bear me out. I may also add that a greater area of irrigated land under the command of Magad tank in Kod Taluka and Dharma canal in Hangal Taluka in the Dharwar Collectorate is black soil." Do you think, from your experience, that in ordinary years the people would take water in these soils if a canal was opened there?—People will take water for such soils if supplied by canals. The lands under the Gokak canal have such, and the water has been used for perennial crops.

9. Q. Do you say so, certainly it is a very important point?—Yes, in these two canals the whole area is black cotton soil and the people use the water, and pay the perennial water rate.

10. Q. How many years have they used it?—Ever since its construction.

11. Q. In your taluka are there many old wells which have not been used recently?—No *pakka* wells have been left unused in Hungund but *kachcha* wells have been left unused. It is only in famine years that *kachcha* wells are sunk for drinking water and for watering cattle.

12. Q. You say in paragraph 7 " the only practical inducement I can suggest is to make the (*takavi*) advance without interest." Now, the Government interest is 5 per cent., what does the sowcar take?—The sowcar demands 12 per cent. and more.

13. Q. And yet they sometimes go to the sowcar to borrow money to build wells?—The cultivators do not go to the sowcar to borrow money for wells but for marriages and other purposes.

14. Q. Do you think that if Government reduced the rate below 5 per cent. it would be an extra inducement?—As

39. I am not in favour of constructing wells in private lands at Government expense, because there is no guarantee that the cultivator will utilize the well water for irrigation, and if at all he uses it no extra rate can be levied from him sufficient to cover the ordinary interest on the amount spent by Government in the construction of well; and if the expenses were to be recovered from the cultivator he would not pay it, because he always considers that the work constructed by Government agency is more costly than that constructed by himself.

40. Temporary wells have begun to be more commonly used only in the year of drought than in ordinary years. But the area irrigated by lift water does not exceed half an acre and that irrigated by a *mot* does not exceed one acre or two at the most. Generally water *juari* is grown in order that it should afford fodder for cattle and grain for the cultivator to last for two or three months. The grant of *tagai* advances is a sufficient encouragement. No other inducement seems to be necessary.

an inducement for the construction of wells I would suggest 3 per cent., or even less, but the rate of interest is already low compared with what the sowcars charge.

15. Q. Did many people come to you to ask for *takavi* advances?—Yes, many people took advances.

16. Q. How much do you generally give of what is asked?—I generally look to the security he offers. If his land is worth Rs. 200 and he wants Rs. 300 he would not get it. I would not give advances of not more than the value of the land offered as security.

17. Q. But if the applicant had plenty of land would you give him the whole of the sum he applies for?—It depends on the orders of the Collector, he sometimes gives orders to give large sums to selected land-owners. In the famine of 1897 the Collector issued orders to the effect that the money was to be given out in small instalments so as to give help to the greatest number of people.

18. Q. Was that a good policy?—That was a good policy for that particular time.

19. Q. We heard to-day from a witness that if a man who wanted Rs. 500 got only Rs. 250 and he could not raise any more money after the well was taken in hand, that it would remain unfinished?—Yes, in some cases wells are left unfinished, but if there is plenty of water the money can be raised from the sowcars or by the sale of the crops which the rayat raises.

20. Q. (Mr. Ibbelton).—I think you said just now that the cultivator never goes to the sowcar for more to build wells?—Yes, but if the well is a good one the sowcar can be got to lend money on the security of it.

21. Q. (The President).—Do you think that the best means to induce the extension of wells would be to lower the interest?—Yes, lower the interest and extend the period of repayment to 20 years.

22. Q. But the law allows 20 years?—Yes, that is the law, but that is not the practice.

23. Q. Do you find complaints made about the time it takes to get a *takavi* advance?—In famine times no delay takes place as a summary process is adopted. In ordinary times the rayat does not care about the delay as he can carry out his improvements in the following season.

24. Q. Supposing that if instead of asking for repayment of the advance Government were to assess the land at wet rate, would that be popular or would it not?—It would not be advisable. We would be doubling the assessment. A man would cultivate the land for some years and when it gave out he would allow it to lie fallow, and it would be relinquished and other people would not come forward to cultivate it.

25. Q. The Government would lay on the assessment all the same?—Yes, but the man would relinquish the land.

26. Q. What do you think the best thing Government can do for your taluka to enable it to withstand famine?—At Balkundi on the borders of the Nizam's territories there is a *nala* and I think a good reservoir could be constructed there.

27. Q. You say in your note that your proposal on the subject would be submitted in a month, have you submitted it?—No, I was told that it had already been submitted.

28. Q. (Mr. Rajaratna Mdir).—Was not the scheme said to threaten the submersion of Iikul town?—No, it was thought likely to submerge Balkundi village.

Mr. Beale.—Explained that the witness was referring to the Itkul project which had been unfavourably reported on by Mr. Joyner and condemned by Government.

29. *Q. Witness.*—There are two rivers in my taluka, the Malprabhu and Krishna; on the former I think a dam like that at Gokak might be made.

30. *Q.* Are there any small tanks in your taluka?—No.

31. *Q.* Would you advocate the construction of tanks?—There are no places suitable for tanks, but many wells could be constructed alongside the *nalas*.

32. *Q.* Have the people been constructing many wells lately?—Yes, 178 wells have been made since 1896-97. Some are *kachcha*, some are *pakka*; they will all be made *pakka* as funds permit.

33. *Q.* I see according to the last Census that your population has gone down from 1,02,894 in 1891 to 83,615?—Yes.

34. *Q.* Were there a great many deaths or was it due to emigration?—The decrease of population was due to (1) more deaths than births, and (2) emigration to the Nizam's territories.

35. *Q.* Were they better off there?—Yes, last year there was a better crop on the borders and the people who crossed over got better wages—they got enough wage in one day to keep them for two in food. There was no famine in those parts. Most of those who migrated have now returned.

36. *Q.* Has this reduction in the population been only since last year?—No, the reduction has occurred since the 1897 famine, several people who emigrated to the Nizam's dominions became well off and remained there.

37. *Q.* Did none of the Nizam's subjects come over into British territory?—No.

38. *Q. (Mr. Ibbetson.)*—It is very common to have emigration in both directions?—None of the Nizam's people come into British territory in our district.

39. *Q. (The President.)*—In paragraph 19 of your printed note you say—"No damage has resulted to the people, but the soil is sure to be deteriorated from irrigation without manure *** irrigated land adjacent to a big canal is found to suffer from salt efflorescence." What do you put the salt down to; do you think it is due to the absence of manure?—Salt efflorescence is due to plentiful rain and long irrigation. If the rain fall is only sufficient there is no danger of salt efflorescence. You will not find lands irrigated from wells suffering from salt efflorescence. The only lands that suffer are those which get more water than is good for them.

40. *Q.* The best cure would be to drain the land, would it not?—Yes.

41. *Q.* Do you think the extensive use of manure would cure it?—The use of more manure would remedy it. If you irrigate without using manure the land deteriorates.

42. *Q.* Have you ever seen drains made to carry it off?—I have not seen any drains in this district.

43. *Q. (Mr. Higham.)*—You say that in black soil you can cultivate sugarcane; would you also cultivate rice?—Rice is not grown so much as sugarcane and garden crops.

44. *Q.* Is wheat grown?—Yes, wheat is grown.

45. *Q.* Supposing Government were to make a large number of irrigation works in this black soil, would there be any demand for water except for cane or other high class crops?—The people do not grow sugarcane alone; they grow maize, wheat, *juari*, plantains and vegetables.

46. *Q.* Up to what percentage would they grow cane?—Not more than 10% of sugarcane. If the land is irrigated by a canal they grow more maize and vegetables than sugarcane, as sugarcane requires watering to a greater extent than the other crops and is therefore more expensive.

47. *Q.* What about maize?—Maize is grown on all irrigated lands.

48. *Q.* When does it want water?—Once in eight days.

49. *Q.* For how long?—It is harvested in three or four months. Three crops can be raised in one year. It is not a very profitable crop. Only one crop of sugarcane can be raised in a year, but it gives a good profit.

50. *Q.* Is the quantity of maize grown very large? I thought that in the Deccan the quantity was not large?—As large as possible on the Gokak canal and any other tank irrigated lands.

51. *Q.* Why don't they grow it under wells?—The area of maize grown under wells is small as the water is used for sugarcane.

52. *Q.* If canals were made all over the country, do you think there would be a general tendency to grow maize?—Yes.

53. *Q.* They would not pay a higher rate?—At present on the Gokak canal the water-rate is Rs. 2 for the first crop and Rs. 2-8 for the second crop.

54. *Q.* Why a higher rate for the second crop?—Because it is raised in the hot season and water is more valuable. Rupees 20 is the price fixed per acre for sugarcane.

55. *Q.* Do they never grow wheat?—Yes, they irrigate wheat, cotton and *juari* from the wells.

56. *Q.* We were told that cotton requires no water?—They irrigate cotton in Gokak in dry years.

57. *Q.* Does it require water in ordinary years?—No.

58. *Q.* You say that it costs Rs. 75 per acre to cultivate irrigated land?—Yes, even in ordinary years.

59. *Q.* What is the money spent on?—It costs Rs. 40 for manure alone in lands through which canals run.

60. *Q.* Is that an annual charge?—Yes, unless we put down 50 or 60 cart loads per acre, we cannot grow a good crop.

61. *Q.* Supposing you are growing a crop of maize, would you put down Rs. 40 worth of manure?—In regard to maize we have two crops and each crop would require Rs. 25 to Rs. 30 worth of manure per acre.

62. *Q.* In black soil?—Yes.

63. *Q.* You say that where there is tank or canal irrigation there is salt efflorescence which you attribute to too much water, could not the supply of water be restricted in some way?—Yes, it can be restricted but the people make channels and let the water on when they go home at night, and when they return in the morning the land is flooded.

64. *Q.* Supposing the supply of water was arbitrarily limited, they could not waste it then?—That would stop water being used in excess.

65. *Q.* Supposing you were to charge the people according to the quantity of water used and not according to the area irrigated so that if the people are careful of the water they would have to pay so much less, would that have the effect of making them more careful?—I cannot say, but I know that a man, who is next to the canal head, is charged for water wasted. He is sometimes prosecuted for wasting water.

66. *Q.* Does that not make him more careful?—He takes his chance. He is not generally caught as the waste occurs at night.

67. *Q.* If he lets the water run to waste, you say he can be fined; who fines him?—I fine him.

68. *Q.* How do you fine him, as a Magistrate or a Civil Officer?—As a Magistrate.

69. *Q.* I suppose as a general rule if a man wastes water the Irrigation Department do not care to go to all the trouble necessary to prosecute?—That is the case, they only prosecute when a man is persistently neglectful or obstinate.

70. *Q.* You say that the culturable area of your taluka is 238,000 acres, of which 238,000 is cultivated. What area is ordinarily harvested?—The cropped area is generally the same as the cultivated area, *viz.*, 238,000.

71. *Q.* Is any of that protected by irrigation?—No, none of it.

72. *Q.* In a very dry year I suppose the whole area cultivated fails?—Sometimes in very dry years much of it fails. There are different kinds of soils. Soft black soil requires less rain than hard black soil. The latter requires very heavy rain. When once it is wet, it does not dry up easily. If only a sufficiency of rain falls, soft black soil gives a good crop. It is on account of these lands that the people suffer, for wheat is only obtainable on them when the rainfall is full. Red soil lands yield some crop even if the rainfall is scanty, but when rain is plentiful they give less valuable crops than black soil.

73. *Q.* In 1900 what was the proportion of the culturable area cropped?—Nearly the whole area was sown, but we had only an all-round one-anna crop.

74. *Q.* Did many people go on relief works?—A few did, but most went to the Nizam's State, because they could get remunerative labour there.

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75. Q. Why did they go to the Nizam's territories, had you no relief works?—We had two relief works in our taluka, but the people preferred to emigrate, as in the Nizam's State the work was lighter and the wage better.

76. Q. Could they not live on what they got from their fields?—No.

77. Q. Supposing some portion of the culturable area, say 10 per cent., had been irrigated, would the owners and labourers of those lands have been protected?—Only four labourers can be occupied on one acre, and if you irrigate 10 per cent. it would only protect the people living on that area, but would not keep all of the people of the other 90 per cent. from going on relief works.

78. Q. (The President.)—Is it not a custom for several families to join together and work a well in a famine year?—No, it is not. But it is the custom for families to emigrate to other countries, buy some land for Rs. 50, paying say Rs. 10 each, and maintain themselves on it by sowing crops till the famine is over. Then they come back. In his own country each man looks to his own benefit as a rule.

79. Q. (Mr. Higham.)—Take one owner only; supposing he cultivates 100 acres, only 10 acres of which are protected; he has a certain number of people living on his holding in ordinary years; drought occurs and he gets only a two-anna crop; would any of his people have to go on relief?—The owner would employ as many only as are required to cultivate the 10 acres. The labourers turned off from the 90 dry acres would go on relief. It is only Desais and Deshpandes who would maintain their people whether they had a good crop or not on the understanding that the people will remain for 10 or 15 years in their service.

80. Q. Would they have to go on relief supposing half the area or 50 per cent. were irrigated?—No, if they got barely sufficient to live on they would not go on relief work.

81. Q. What would you call barely sufficient?—A four-anna crop. They could easily maintain themselves on a four-anna crop.

82. Q. (Mr. Ibbetson.)—You say that in the famine a summary procedure was followed in giving out *takavi*, what was the main difference between the summary and the ordinary procedure?—In the summary procedure of *takavi* we dispense with the issue of notices, we also dispense with the inspection of the land on which the improvements are to be carried out, we do not visit the land and value it, and we do not trouble to find out if the sower has any lien or mortgage on it. We simply find out whether the land is sufficient security judging by assessment or by enquiry from the panch or village officers, who accompany the applicant. We make *visd voce* enquiries. We generally calculate twenty times the assessment. Unless the land is garden land we can see from the rate of assessment per acre what the value is.

83. Q. Do you think that the Government ran much risk in lending under that procedure?—No, I think the Government ran no risk.

84. Q. Do you think that that procedure could be followed in ordinary years?—Yes, it might safely be followed. Lately a circular order has been issued to the effect that the Mamlatdars are to be supplied with all information concerning the register of sales, mortgages, etc., of lands.

85. Q. He will have to refer to the Registrar in future; you think that procedure can be safely followed?—Yes, we had no means of ascertaining before.

86. Q. You say that your taluka is not suitable for tanks, why?—Because my taluka is flat and tanks cannot be made.

87. Q. You say that many wells made in 1896-97 and since were built *kachcha* and will be made *pakka* as funds permit, would it be a good thing if Government could help the people to make them *pakka*?—Yes, it would be a good thing to help the people to make the wells *pakka* by the aid of *takavi* advances.

88. Q. If a well is once made you can safely advance more money to make it *pakka*, as its construction has made the land more valuable. If we offer more money now on favourable terms, would the *rayat* accept it?—Yes, but sometimes a man who has 5 acres builds a well and the well does not stand, and it has to be built of stone. In my taluka stone is not available and the construction of a well with stone and mortar costs a considerable sum. The man would have to spend more money than the land is worth. In such a case we could not advance more.

89. Q. Supposing Government was willing to take the risk. Say a man had spent Rs. 300 on a *kachcha* well and he wanted Rs. 400 more to make it *pakka* though his land was

worth only Rs 500, do you not think that Government might not make the advance; would there not be honest men who would come to take the money and repay it?—It is difficult to discern honest men from others. I think there would be great risk in giving advances of sums above the value of the land.

90. Q. Do you think there would be any great risk; of course there would be risk; but you say Government might lend a good deal for the construction of wells; would it not be worth Government's while to run a little further risk to have the wells made *pakka*?—I cannot say one way or the other.

91. Q. In your printed note you say that land deteriorates unless well manured, do you speak from experience?—Yes.

92. Q. Do you refer to canal irrigation?—I have irrigated land from the Gokak canal, from wells and from the nalhahs.

93. Q. Did you not use enough of manure?—I know that the land deteriorates unless manured; so I always use manure. Those who do not do so, do not get such good crops as mine.

94. Q. It is not a question of crop it is a question of soil, why do you say the land cannot be irrigated without being manured?—I let some of my lands at times and the tenants put manure on it for two or three years and get good crops; in the year in which the lease expires they do not manure the land, and an inferior crop is the result. They do this in order so that I shall not get the benefit of his manure.

95. Q. And very sensible men too. I understand that the crops will fall off if the manure is not renewed. That is all you mean by land deteriorating without manure?—Yes.

96. Q. (Mr. Higham.)—Supposing a piece of land will give a certain yield without manure, will it yield less than that if you go on irrigating without using manure?—The land will yield less and less unless manured. If irrigated by a well a crop could be got with very little manure for two or three years, but after that more manure will be required.

97. Q. (Mr. Ibbetson.)—Can you grow *rabi* crops in your taluka without irrigation in ordinary years?—The *rabi* crops are irrigated.

98. Q. In black soil do the people water *juari*?—Yes, but it is not a paying crop, except when used for fodder in bad years.

99. Q. Would they irrigate wheat in a good year?—Yes.

100. Q. Is all the water of the Gokak canal used every year?—Yes, there is always a greater demand than it can meet.

101. Q. Does it never run dry?—Last year, or the year before it ran dry for the first time since 1896-97.

102. Q. (The President.)—Does the Gokak canal come into Bijapur?—No, it does not come into Bijapur, but the Superintending Engineer says the canal could be brought into Bijapur were it not that it would have to come through the Native States of Mudhol and Jamkhandi.

103. Q. (Mr. Ibbetson.)—Did the water-supply in the wells fail in 1896-97?—No, but there was a deficiency.

104. Q. You had good rains in 1898-99, how did they behave in 1899-1900. Did they fail?—They did not fail much in 1899-1900. In 1900-1901 was the crisis.

105. Q. Last year when they were at their worst, what proportion of the normal area did they irrigate?—Not more than one-fourth. They did well for the first year, pretty well in the second and failed in the third.

106. Q. You state that the depth of the black soil in your taluka is three feet. What is there underneath it?—Muram or sand.

107. Q. You propose that in giving *takavi* we should remit the interest for first two years; when is the first instalment taken?—Twelve months after the money is advanced.

108. Q. How long does a man take to make a well?—It takes a long time, as the cultivator must wait for the hot weather to test the supply before building the well. Only after he is satisfied does the cultivator construct the well finally. It takes another year for him to level his land—altogether two years.

109. Q. He tries it first as a *kachcha* well?—Yes.

110. Q. Then you begin to recover before the well is ready to be worked?—Yes.

111. Q. Do you think that wise?—No. The first recovery might be made later—after two years.

112. Q. Is any rice grown in your taluka?—Only a small quantity.

113. Q. Speaking of channels from the nullahs, you say that it would be a good thing to encourage the people to make them; but that there is the difficulty of having to take them across other people's lands. If that difficulty could be overcome would the digging of channels be taken up?—There are some people who would do so.

114. Q. Have you ever been asked by the people to take up land for this purpose?—No.

115. Q. If they dig channels what would they have to pay for the water?—If the water is perennial the rate will be Rs. 4 or Rs. 5, if it is only monsoon water the rate will be Rs. 3.

116. Q. Supposing Government were to say this is an insecure tract, the water is running to waste, we want to get the water used and we will give the water for nothing; would many of the people take it on those terms?—Yes, if there were no charge for water; many people would very willingly make channels.

117. Q. Is there a good deal of room for that kind of work in your taluka?—Yes, a good deal could be done.

118. Q. What area could be irrigated if that were done?—About 100 to 200 acres could be irrigated—there are only two nullahs.

119. Q. In your note you say:—"The increase in the total value of the produce per acre due to irrigation is estimated to be Rs. 3, both in a year of drought as well as in a normal year," Rs. 3 must surely be a misprint, ought not the figure to be more than that?—I would like to refer to the original, it must be Rs. 13.

120. Q. Supposing one man has an acre of dry crop and another has a well and grows an acre of vegetable, would not the difference be more than Rs. 13 per acre?—As regards my own land irrigated by the Gokak canal I can say. If I sow sugarcane I should have to spend Rs. 150 and would get Rs. 100 profit, if I sow other crops such as maize, etc., I should get Rs. 50.

121. Q. Supposing you had no irrigation?—In that case on the same land I would get Rs. 10 to Rs. 25.

122. Q. (Mr. Muir-Mackenzie).—Have you had any experience of *tāls* on your lands?—Yes there are *tāls* on my land.

123. Q. Do you think there is much scope in your taluka for work of this kind?—Every cultivator with means makes *tāls*. I am sure if cultivators had the money they would do so.

124. Q. Have you ever given *takavi* for *tāls*?—Yes.

125. Q. In some parts of Bijapur *tāls* are preferable to wells, are they not?—Yes, I know that in one case Rs. 1,000 to Rs. 1,500 has been spent in a *tāl* and spent profitably.

126. Q. Are not *tāls* faced with stone?—No stones are required, stones are only used or required when making sluices for big *tāls*.

127. Q. Have you not seen the ends of the terraces made with stone?—No, but the waste weir might with advantage be made of stone.

128. Q. Have you not seen big *tāls* made of stone work?—No.

129. Q. You say that in some parts of the district they are more effective than wells?—Yes, when *tāls* are put across a nullah they must leave it for three or four years before being used to allow the land silt up. After three or four years rice could be grown.

130. Q. In your taluka they don't grow rice?—Yes, they do.

131. Q. And *juari*?—Rice is more profitable than *juari*.

132. Q. You mean that for two or three years you will grow *juari* under the *tāl* your ultimate aim being to grow rice?—Yes.

133. Q. Would lands under a *tāl* produce good crops in a famine year?—Yes, they would produce good crops even in a year of famine when other lands would not be yielding a crop. Three years ago I put up a *tāl* and it was washed away but I repaired. There was a failure last year, but the four acres which had the advantage of the accumulation of water under the *tāl* yielded a first class crop.

134. Q. (Mr. Rajaratna Mātr).—In this *tāl* land if you grow paddy, is the assessment enhanced?—No, it will not be enhanced till the next revenue settlement.

135. Q. Can the classification of the soil be altered?—The classification can be altered, but it is not altered if the improvements are made by owners at their own cost.

Mr.
Beligeri.
6 Jan. 02.

WITNESS No. 72.—MR. IBRAHIM AHMADI, L.C.E., F.R.I.B.A., Executive Engineer, Bijapur District.

Answers to printed memo. of questions.

1. Para. 3 of Memo.

Experience as regards black soil.—Small tanks constructed in black soil do hold water. Only small dams of about 12 feet high or a little over can be made of black soil without masonry core walls, provided the top and outer slopes are protected by masonry and the inner by pitching. In the second class tanks in this district water is being utilised even during seasons of average rainfall generally for rice and vegetable. I have no information available for the next sentence. I believe there is a desire for irrigation works in black soil, and construction of tanks in such soils would be as remunerative as for other classes of soil.

2. Para. 4 of Memo.

Description of existing Government irrigation works.—There is one first class tank, viz., the Muchkundi Tank and 16 second class tanks in this district, the irrigating capacity of which and range of variation together with all other information for these as well as for works proposed have been collected by Mr. Beale, the Superintending Engineer on special duty, and all questions on these points will be answered by him. None of these works can be depended on in a season of drought.

3. Para. 9 of Memo.

Classification of works on which relief labour was employed in this district during the famine of 1899-1900, 1900-1901 and the current year and the amount expended on each class:—

Class of work.	AMOUNT EXPENDED.		
	1899-1900.	1900-1901.	1901-1902 up to the end of September 1901.
	Rs.	Rs.	Rs.
Roads	33,460	64,378	93,890
Metal-breaking . . . . .	...	...	33,104
Irrigation work	26,725	2,19,855	1,65,987

A small amount was also spent by the Civil Department on village tanks and by the Bijapur Municipality in clearing out wells in the town.

Works uncompleted at end of famine.—As regards roads constructed during famine, no further expenditure in completing them need be incurred. Excepting where *pakka* cross drainage works are necessary, the roads are finished in all respects. Portions of the roads not touched are not of sufficient importance to warrant further expenditure from Provincial or Imperial Funds. As regards irrigation works, all information required in this paragraph will be submitted by Mr. Beale.

4. Para. 12 of Memo.

Statistical information for the Muchkundi Tank:—

I.—Initial Statistics.

Area and nature of catchment—26 square miles, partly hilly and partly black soil.

Assumed average rainfall—23.50 inches.

Full supply capacity of tank in million c. ft.—624.

(The capacity originally proposed was 302 million c. ft., the present increase being due to the dam having been made too high for reasons of construction.)

Percentage of capacity on assumed average rainfall—42.32. (Originally proposed—21.18.)

Water spread at full supply—44.18 million sq. ft.

Maximum height and total length of dam:—

Height 60 ft.
Length 421 ft.

Cost of—

	Rs.
Dam	67,014
Waste weir	5,105
Sluices	2,172
Compensation for land submerged by tank	13,478
Cost of canal and distributing channels	18,874
Total capital cost	1,58,707

Mr.
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II.—Annual statistics for each year for the Muchkundi since completion.

Year.	Rainfall.	Amount stored in million cubic feet.	Amount run over waste weir.	Total run-off, million cubic feet.	Percentage of run-off to rainfall.	Area irrigated in acres.	Quantity of water left in tank at end of irrigating season and available for next year.
1886-1887 . . .	25.28	12.452		163.41	11	3	Nil.
1887-1888 . . .	23.97	31.771		170.92	12	3	Nil.
1888-1889 . . .	22.92	39.710		146.11	10	2	5.96
1889-1890 . . .	21.83	103.008		232.12	13	2	...
1890-1891 . . .	20.67	60.367		123.40	10	11	69.03
1891-1892 . . .	11.68	15.72		69.03	11	205	7.93
1892-1893 . . .	35.97	26.56		432.15	21	3	55.03
1893-1894 . . .	27.32	233.85		247.78	21	12	223.73
1894-1895 . . .	20.76	201.72	Nil.	154.07	16	19	194.15
1895-1896 . . .	14.40	124.64		51.26	8	20	117.72
1896-1897 . . .	6.97	16.90		Nil.	Nil.	10	30.16
1897-1898 . . .	23.10	119.03		219.47	20	5	76.43
1898-1899 . . .	23.23	114.51		193.80	17	4	69.03
1899-1900 . . .	23.39	171.72		281.95	24	64	69.03
1900-1901 . . .	20.22	133.59		147.97	14	77	122.30

All available initial statistics for new projects will be submitted by Mr. Beale.

5. Para. 13 of Memo.

Scale of water-rates.—On Muchkundi Tank, which is a minor work the charges are Rs. 8 for perennial, Rs. 4 for eight months, Rs. 2 for four months, Re. 1 for monsoon dry and Rs. 4 for special hot weather crop per acre. Application for water is received during the whole year. There is very little irrigation under this tank. A karkun, who is paid Rs. 5 per month for the work, looks to the distribution. During years of favourable rainfall there has been less demand for irrigation under the Muchkundi Tank. Second class tanks are always empty at the end of irrigating season, i.e., in hot weather. The only new tank constructed during recent years is the Muchkundi Tank, the irrigation from which has hardly affected the revenue derived from lands under it. Maintenance charges for Muchkundi Tank are fair. As regards second class tanks, they are only repaired if the rayats contribute 10 per cent. of the cost. The maintenance charges for these tanks are also fair. No revenue accounts are kept for second class tanks and the irrigation operation of the Muchkundi Tank is too small to answer the last sentence of this paragraph.

6. Para. 14 of Memo.

Protective value of irrigation works.—Muchkundi Tank is the only protective irrigation work in this district. The areas irrigated under this tank are given in reply, to paragraph 12. This tank hardly yet protects any area, and its existence makes no difference in the extent of famine relief operations of this district.

1. Q. (*The President*).—You are Executive Engineer, Bijapur?—Yes.

2. Q. How long have you been here?—For four years. I have all the local works in my charge.

3. Q. I suppose that there is so little irrigation in the district that you have not bestowed much attention to the subject of irrigation?—That is so.

4. Q. You have the Muchkundi and Sangogi works under your care?—Yes; I am looking after them, the latter is a famine work and is under construction.

5. Q. You have heard what the last witness said about black cotton soil taking irrigation freely is that your experience?—I cannot say; I have no experience.

6. Q. Why is the Muchkundi tank not doing better?—The dam is too high and it never fills. People want a guarantee that they will be given a sufficient and permanent supply.

7. Q. The people don't ask for that guarantee elsewhere?—No.

8. Q. Is the tank badly made?—No, the tank is well made.

9. Q. Is all the available water used?—No, the water is not all used.

10. Q. (*Mr. Ibbetson*).—Not even in a famine year?—No, not even in a famine year.

11. Q. (*The President*).—What is the cause?—The excuse is that they are not sure of getting water always.

12. Q. (*Mr. Higham*).—Why should they not irrigate *rabi*; they would know how much water there was at the end of the rains?—I do not know why they do not do so.

13. Q. (*The President*).—What do they grow?—Sugarcane and garden crops.

14. Q. Do you not think there must be some reason beyond that which you have given; are the rates too high?—I have never heard any complaint about the rates being high.

15. Q. When was this tank finished?—It was finished before I came here.

16. Q. (*Mr. Ibbetson*).—Is the water rate for *rabi* crops prohibitive?—No; but some two years ago I went to Bagalkot and had a conference with the cultivators when they demanded a guarantee and also made a proposal which I have mentioned in my note in Mr Beale's book. They said also that they feared that the revenue would be increased if they irrigated high class crops.

17. Q. (*The President*).—Don't you think there must be something in the back ground that we do not know about?—I cannot say.

18. Q. (*Mr. Muir-Mackenzie*).—They wanted a guarantee; what would have happened if the water failed?—I could not be sure of the water-supply in the tanks and so could not give the guarantee, if the water failed the cultivators would have come down on us for damages.

19. Q. (*Mr. Ibbetson*).—I can understand the attitude of the people in an ordinary year, but what about a famine year?—The people have taken more water during the last two years of famine.

20. Q. When was it that you made the enquiries you refer to; was it before the famine or after it?—After, the 1896-97 famine.

21. Q. (*The President*).—In 1891 and 1892 I notice from the table in your note that the people began well?—Yes, that is the highest area on record.

22. Q. The next year the area went down to three acres?—Yes.

23. Q. (*Mr. Muir-Mackenzie*).—What was the soil commanded?—A good deal of the soil is black soil.

The President then read the following note by Mr. Ahmadi from page 48 of the Report on Irrigation Works, Bombay, 1901:—

"While I was at Bagalkot, the Mamlatdar was good enough, at my request, to invite all the principal cultivators under the Muchkundi Tank to meet me. Most of them came, and a long conference ensued during which it transpired that the cultivators did not care to make use of the water for temporary crops such as *rabi* and *kharij*, as they say that the expense and trouble is not sufficiently compensated. It appeared to me that being unaccustomed to artificial irrigation they were not enterprising enough and were quite satisfied with what the rains brought them. Most of them were, however, quite prepared to go in largely for perennial irrigation if they could be certain of a continuous supply, their intention being to sow plantain, sugarcane, and other paying garden produce. They were deterred, however, by the risk involved. They told me that it cost about Rs. 200 per acre to prepare land for a plantation of the above nature and it began to yield profit after two years' labour at the rate of Rs. 100 per acre per annum. If during the interval the water-supply failed the trouble and expense incurred would be entirely lost. After a good deal of conversation some of the cultivators came forward with a proposal to make an experiment with 9 acres of land on the main canal of the tank and 7 acres on its branch under certain conditions, and they drew up a statement in vernacular which I submit in original. The conditions in effect are that on the lands proposed water should be supplied continuously for five years and in case of failure Government should undertake to indemnify them for the actual loss sustained, such loss to be determined by a Panchayat in the usual way. If this proposal is at all seriously entertained, an estimate of the loss incurred at different

periods by the failure of water may be made by the figures given in the penultimate sentence of the preceding paragraph. Although I cannot say that the cultivators are unreasonable, yet looking to the condition of the tank I cannot possibly recommend the proposal. For even if we are fortunate enough to supply them continuously with water during the guaranteed five years, there is no certainty that the cultivators will increase or even continue the cultivation after the period without a fresh guarantee. I am afraid that as long as they see the water standing in the tank at the level where it usually does now, they will be requiring a guarantee. I submit a statement showing the height and quantity of water since its construction and the area which could have cultivated. It thus has to be concluded, therefore, that as the tank stands there is not much prospect of extending its irrigation, for as stated above the cultivators will not take the water available for temporary irrigation and for continuous irrigation which they want, we are not in position to guarantee a supply. Thus we have to fall back upon ways and means for improving the supply of the tank. The only practicable scheme proposed in this connection is the extension of the catchment area of the tank by diverting the Hungargi Nala into it. This matter was finally disposed of with the correspondence ending with this office letter No. 3554 of the 5th November 1898. I am, however, not satisfied that all possible lines for the feed channel have been fully investigated. But further investigation is hardly possible without a contour survey as suggested by me at the end of this office letter No. 1319 of 24th March 1898. If this is done, it is just possible that a line may be found for a broad feed-channel with a low dam across the *nala* giving a very desirable sort of work as a famine project."

24. Q. (*The President*.)—There is, I notice, a project for a feeder from the tank?—Yes, only trial lines have been made so far but the results are pronounced to be discouraging.

25. Q. What river does the tank depend on?—The water is taken from the Muchkundi and has no communication with the ghâts.

26. Q. Can you suggest any means by which the tank could be made more useful?—The only scheme is to take water from the Hangargi *nala*. A dam and canal were proposed but it promised to prove very expensive as there would have to be a good deal of rock-cutting. The idea was to have a dam as well as a canal but the waste weir would prove very costly. If we could divert the *nala* it would be good thing.

27. Q. Is the *nala* so large that you could not do that?—It would probably not be possible to divert the *nala* without building a dam.

28. Q. Tell me something about the Sangogi and Huloor tanks. What state of progress are they in?—On the Sangogi tank the puddle trench is nearly completed on the left bank.

29. Q. Are there large parties on the work?—At present there are only small parties. At one time we had 16,000 people at work, now we have only about 2,000.

30. Q. You have not done much to the dam?—No, only the puddle trenches are being completed.

31. Q. The dam is a very long one, is it not?—Yes, nearly two miles long; the puddle trench is 60 feet deep and the water depth will be 65 feet.

32. Q. Of course the work of construction of the waste weir has not been touched?—No.

33. Q. Do you think it is desirable to finish this work?—Yes, it should be completed, it is a promising work.

34. Q. Would the people take water any more than they do from the Muchkundi?—I do not know.

35. Q. What is the state of progress of the Huloor works?—We are filling in the puddle trench at Huloor.

36. Q. There too you have not done anything to the dam?—No.

37. Q. Are these the only relief works you have?—Yes, as far as tanks are concerned, but we have two other relief works for making roads.

38. Q. Are they going on now?—Yes, previously there were many more.

39. Q. Would it be possible to transfer people from roads to tanks?—No tank works are unpopular, not 10 per cent. of the people would go on them.

40. Q. (*Mr. Higham*.)—Why are they unpopular, are they too far away from the villages?—I do not know the reason, but I know that they do not like to go on tank works

41. Q. You say that on all second class works in the district the water is used for irrigation, how many second class works have you got?—From 14 to 16. I believe that all the water in these tanks is used. I have nothing to do with them, the Revenue Department looks after them.

42. Q. Have you not to repair them?—Yes, when the *rayat* contributes 10 per cent. of the cost of repairs.

43. Q. Do you keep any revenue account of them?—No, the Public Works Department do not keep any revenue account of them.

44. Q. I suppose the Collector does?—Yes, the Collector does.

45. Q. To come back to the subject of the Muchkundi, I do not quite understand why the people will not go to the expense of cultivating perennial crops on a work of that kind. On almost all tank projects which are laid before us, the conditions are similar to the Muchkundi, they are liable to fail at the end of the season. If you have water left in your tank at the end of the season, how is it that the people do not irrigate *rabi* crops?—It may be because the people are not accustomed to irrigate in those parts.

46. Q. But you say that they do irrigate on all the second class works?—They do. I cannot account for it.

47. Q. Supposing we made this tank over to the people and they were allowed to irrigate without payment of any water rate, and we left them to develop it themselves, would they take it for *rabi* irrigation, that would be putting the Muchkundi in the same condition as a second class work?—It would be worth a trial.

48. Q. It is not profitable now?—No, it does not pay its working expenses.

49. Q. With regard to Sangogi and Huloor can you say what the value of the work done on these two works is?—I cannot say offhand.

50. Q. We have to consider whether it is worth while completing these works. You must have some idea of what has already been spent on them?—The Sangogi works are estimated at 18 lakhs.

51. Q. Yes, then what do you think is the value of the work done?—At normal rates I think the work done amounts to 1½ lakhs. There are now 2,000 men employed on it.

52. Q. Are they likely to continue?—Yes, till October next.

53. Q. Do you think 1½ lakhs near the mark as to the amount already spent or would you like to examine the figures?—I should like to examine the figures, but I think the figure I have quoted is about right.

54. Q. If we assume that the works will cost 18 lakhs, you have done 1/12th of the work?—Yes.

55. Q. What is the value of the work done on the Huloor?—The Huloor is a small work. The estimated cost is 4 lakhs.

56. Q. Yes.

57. Q. You were working on it in 1900?—We commenced the work in 1900.

58. Q. What is the value of the work done on that tank?—I think at normal rates Rs. 40,000 to Rs. 50,000 or about 1/10th of the estimated cost.

59. Q. You might finish this in the course of another two famines?—Yes, the Huloor tank might be finished during the course of another two famines, but the Sangogi tank would take longer.

60. Q. What about the land under the dam, has it been taken up?—The land has been partly taken up.

61. Q. Of course the rest will not be taken up till actually required?—No.

62. Q. (*Mr. Ibbelton*.)—Do you know anything about the Nilgundi and Inchgeri tanks?—No, they were disposed of before my time.

63. Q. (*Mr. Rajaratna Mdlr.*)—According to your system of application there is no guarantee that the *rayat* will get water, and there is no certainty if he gets it this year that he will get it next?—We give no guarantee.

64. Q. It is open to you to refuse to give water?—Yes.

65. Q. Does that act as a deterrent?—The operations so far have been too small to judge from.

66. Q. Large quantities of water are left unutilised, something like 122 million cubic feet were unutilised in 1901, what area could that have irrigated of garden crop

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and vegetables?—I cannot say without the book. About 600 acres.

67. Q. Supposing the *rayats* were assured that when the crops fail the whole assessment will be remitted, will that induce them to take water?—My idea is that the people would not only ask for remission, but for compensation as well.

68. Q. So mere remission of assessment will not induce them?—No.

69. Q. Do you see any objection to allowing a certain fixed portion of the holding to be irrigated each year?—I think fixed areas of irrigation might give some encouragement.

70. Q. I notice that the receipts from the Muchkundi are shown as Rs. 344, the "Miscellaneous" item being Rs. 232, how is that accounted for?—The "Miscellaneous" revenues are from factories in Bagalkot and from sale of babul pods.

71. Q. Are there any wells in the area commanded by this tank?—I am not aware of any wells.

72. Q. Are there facilities for the construction of wells and is it probable that water will be found at a reasonable depth?—I cannot say.

73. Q. Would it be a good thing to introduce wells in the vicinity of tanks?—Yes, I think they might be encouraged.

74. Q. Has this point been considered?—No.

75. Q. I suppose owing to the presence of the tank the spring level would be higher?—I think it would be higher, but the spring level would be more than 20 feet below the ground.

76. Q. With regard to the two projects you have mentioned—the Sangogi and Hulcor, what area will they irrigate?—The areas likely to be irrigated under the Sangogi and Hulcor have been given by Mr. Beale in his report as 7,000 and 1,700 acres, respectively.

TWENTY-EIGHTH DAY.

Bijapur, 7th January 1902.

WITNESS No. 73.—MR. J. MOLLISON, M.R.A.C., Inspector General of Agriculture in India.

Mr.
J. Mollison.

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Note by Witness on possibilities in the Deccan of extension of protective Irrigation Works.

The Deccan and parts of the Southern Mahratta Country are in greater need of protection by irrigation against drought than other parts of the Presidency. In my note already submitted to the Commission I have discussed at some length the value of wells in these least protected parts. I am aware that the well-irrigated area in the Deccan Districts in 1900-1901 was less than that of 1899-1900 by nearly 90,000 acres. This is attributable to failure of water supply, the result of scant rainfall in the more open plains during four or five consecutive years. Good rainfall during one or two years will again raise the water-level and the well-irrigated area will again expand. If proper encouragement is given there will be further expansion.

2. At Surat I suggested to the commission one means of encouragement. I proposed that Government should offer a premium of Rs. 25 per acre of good crop produced in the first year between the 15th of October and the 1st of May by regular irrigation with sweet water from a *pakka* built well. The total amount per well should be limited to Rs. 100 where the depth is less than 30 feet and to Rs. 200 where deep and very costly wells are required. Nothing should be given for shallow wells with depth to water less than 18 feet.

3. I would post a notice signed by the Collector in every village in the unprotected parts of Gujarat, the Deccan and the Southern Mahratta Country stating that the object of offering the premium is to encourage the construction of wells in all favourable positions, so that there would be a means at hand for producing food for the people and their cattle in portions of all villages in famine years or in years of scant rainfall; and also of providing in these seasons remunerative work for some at least of the people. In the same notice, in order to allay suspicion of ulterior motives an absolute pledge should be given that Government will not at any time raise the assessment on well-irrigated lands in any greater degree than on similarly assessed dry crop lands. The premium which I recommend should pass directly from the hands of the Collector or one of his Assistants to the hands of the owner of the well.

4. In the unprotected parts of the Deccan I do not expect to see any very material increase of protection by new canal or large tank projects worked by the State. The supplies of water for existing canals can no doubt be increased by additional expenditure for storage. The Deccan generally lends itself unfavourably to any large system of canal irrigation and such irrigation is not at present to any great extent protective for various reasons. The chief reasons are—

(i) that the surface of the Deccan is rolling and irregular, and the soils which are specially suitable for irrigation except in open plains far from catchment areas occur to a large extent in patches;

(ii) that in order to command these patches the course of a canal near its head work must be exceedingly tortuous. The canal must to a considerable extent be constructed through upland, light soil, muram and hard trap. The prime cost must, therefore, be large and the waste in leakage from the canal itself will be very great;

(iii) that the distributing water channels have often to be made long distances through light soil which is unsuitable for regular irrigation. As much water may leak from the distributing channels as reaches a field if it is a small isolated area of a few acres only;

(iv) that in years of drought existing canals fail to supply, when most urgently needed, sufficient water for the area of crops ordinarily commanded by them;

(v) that they are worked more for revenue than as protective works. Intensive perennial irrigation paying high rates on comparatively small area is encouraged. Water-logging to a serious extent has thereby been produced. It will get worse unless drainage is arranged for or a radical change made in the system of irrigation.

5. The intensive system of irrigation above referred to has produced extraordinary valuable crops of sugarcane in the Poona District. A class of speculator landlords rather than *bona fide* cultivators has been thereby enriched. Land of good class commanded by the canal has become exceedingly valuable. I take it that it was not the intention of Government that a canal designed as a productive work should be the means of enriching land-owners who are not themselves cultivators and who, when the pinch of famine comes, accept little or no responsibility in providing food or work for starving people. This landlord class of people has been largely benefited by the Kharakwasla Canal and possibly also by the Nira Canal.

6. In encouraging the intensive system of canal irrigation above referred to, the irrigation officer pledges himself morally, if not actually, to give canal water throughout the year for the more valuable perennial crops which pay high rates. In a year of drought this pledge makes it impossible for him to give, to any considerable extent, water sufficient to save withering kharif crops. He must save sufficient water for irrigation in the hot weather of the following year. He will freely admit that it does not pay to give, at the ordinary rates, canal water to save a withering kharif crop. An enormous amount of water is certainly absorbed in the first watering by black soil which has dried and cracked. The owner of a kharif crop in a year of drought wants water however before the soil gets to this stage of dryness. He is prevented from getting water at the right time because a permit is necessary. He does not apply for a permit until he sees signs of his crop withering. He does not usually get it until his crop is past saving. During the last five years canal water has been used

repeatedly to help or save withering kharif crops on the Government Farm at Kirkee. In the 1899 famine year three waterings were found necessary. The first watering was got in time. Formal sanction was afterwards obtained. An ordinary cultivator could not so easily have arranged with the Irrigation Department in sufficient time to save his crop. The actual outturn of grain and fodder at the Kirkee Farm from the irrigated crop referred to compared favourably with that of ordinary years and owing to high market-rates was worth about double as much as usual.

7. A cultivator knows perfectly well how valuable canal water would be in a year of drought in saving a crop which would otherwise wither; but if he is to take advantage there must be no obstacles put in the way of his getting the water in time. I should therefore make him free to take the water during the kharif season without a day's delay when he wants it if it is running in the canal. I should safeguard the Irrigation Department as regards water-rates by compelling the cultivator under penalty to give information regarding his requirements on the date he begins to irrigate. He will not take water unless he urgently needs it. The expense of leading water over uneven land with no system of beds is considerable and the water-rate has to be paid.

8. I confidently believe that the Kharakwasla and Nira Canals which are the most important irrigation works in the Deccan, would be much more protective than they are and would irrigate much larger areas than they do (a) if less water was saved for irrigation of perennial crops between the 1st April and the break of the next monsoon; (b) if more water was used during drought for kharif crops; (c) if free scope is given for the irrigation of food grain and other crops between the middle of October and the 1st of April. I believe that higher rates than those now charged for kharif and rabi irrigation would be quite justified. But in any case until experience and results are obtained, the question of revenue should be made subordinate to that of security against famine.

9. I am entirely against irrigation officers pledging themselves either morally or actually to give canal water for perennial crops between the 1st of April and the beginning of the rains in any year. I would rather be inclined to issue a year's notice to the present sugarcane growers and others to the effect that the Irrigation Department cannot guarantee in any year a supply of canal water for perennial crops between the 1st of April and the break of a favourable monsoon.

10. Within recent years many of the sugarcane crops grown under canal irrigation in the Poona Districts have been exceedingly valuable and the superior holders or

occupants of the land thus irrigated can very well afford to construct wells to irrigate their crop in the hot weather. The chances of getting water at reasonable depth are pretty certain and the wells if constructed will be a great safeguard during season of scant rainfall and will in all seasons be a mutual help to the canals.

11. Mr. Visvesvaraya has explained to me the block system of irrigation which he has proposed for canals in his charge. The system would in my opinion act excellently if he can get village communities to choose their areas, if each village community regulates the distribution of the water equally to the village block and if perennial irrigation is restricted.

12. I do not think small tanks in the open plains of the Deccan will be of much use. They will not fill except in years of exceptional rainfall and even if full in the rains they will not hold water long during the fair season. Mr. Visvesvaraya proposes to have storage tanks along the course of a canal to be filled as required from the canal. The proposal is, I think, sound and could be made to fit in with his proposed block system of irrigation. Leakage from such tanks would help well irrigation. But it is very difficult to see how water rates are to be arranged for this mutual support system unless a village community agree to pay a lump sum for a term of years for the irrigation advantages received. The community could apportion among themselves the amount which each occupant should pay. Theoretically there are great possibilities, but I do not quite see now it is all to work out smoothly in actual practice.

13. There is great scope for extension of irrigation by pāt from *bandharas* throughout the Deccan. Extension of well and pāt irrigation should be encouraged together. A complete survey regarding possibilities is required. Only practical experienced officers who can consult the people as to their requirements should be put in charge of such survey. The surveyor will determine where pāt irrigation is practicable without infringing on down stream rights. Having determined this point, village communities should be encouraged to undertake the work themselves. No charge for the water should be made for a term of 5 to 10 years. Afterwards a very moderate lump sum for each *bandhara* should be charged. The people can make their own arrangement regarding apportionment. Government should also give an absolute pledge that the assessment of pāt irrigated lands will at no time be raised higher than similarly assessed dry crop land.

14. I believe that if the people are encouraged to construct wells and *bandharas* throughout the Deccan in the manner I have sketched a very full measure of protection against famine will be reached in a very few years.

1. Q. (*The President*).—We have received your paper and I have read it with a great deal of interest. I gather from it that you think the best means of protecting the country against famine is by wells and *bandharas*?—Precisely.

2. Q. Although it is a recognised fact that in times of prolonged drought the water in wells goes down considerably?—It certainly goes down, but I imagine that canal irrigation would go down to the same extent or even more. During the past 5 or 6 years, a worse condition of affairs has been experienced than usual. There have been a succession of famines since 1896-1897, and notwithstanding that fact the wells have done comparatively well.

3. Q. You believe irrigation from canals has gone down equally?—Yes.

4. Q. Take the Nira canal; has that gone down?—No, but the circumstances there are exceptional.

5. Q. What makes you say so?—The conditions on the Nira are most favourable. It is led away from a catchment valley in the Ghāts straight to land most favourable for irrigation.

6. Q. Is it the only valley of the sort available?—You could get land as favourable for irrigation in the open plains of Ahmadnagar, Sholapore and the Southern Maratha country where similar conditions might develop, but not, in my judgment, so near the catchment area.

7. Q. You would have your canal leaking so that when you reached a good spot your water would be all gone?—That is an engineering question. I would like to see a thorough survey made.

8. Q. (*Mr. Ibbetson*).—The loss of water that you refer to would be the same in all years, why should canal

irrigation decrease in famine years?—The head-works would not fill in a famine year. The depth to water in a well is not much greater in a first famine year than in an ordinary year, and it is not much worse than an ordinary year in a second famine year: the supply of water in a well is safer than a supply of water in a canal.

9. Q. (*The President*).—Is not the supply of water equally good in the Ghāts?—In the Ghāts catchments you get rain probably in a famine year, but even with this safeguard canals are not so protective as wells. On the Mutha Canal in the Kharif season a good deal of water runs to waste in ordinary seasons. If good rain comes in October the people freely apply for water for sugarcane; if the late rains are deficient such applications are not freely made.

10. Q. That is, they anticipate that there will be a decrease in the canal supply. May it not be that there will be a greater demand for other crops?—They know it by experience. Cane is planted between December and the February following and when the cultivator knows positively that the canal water-supply is sufficient he is keen to apply for water for cane. If there is deficient supply no cane is grown.

11. Q. (*The President*).—May not the bad supply for cane arise from the greater demand for other crops rather than from a less actual supply of water. Perhaps Mr. Beale can tell us.

Mr. Beale.—The Kharakwasla always fails; but irrigation in the hot weather depends on the balance in the tank and that depends on the late rains; if those are good less water is used for *rabi* and there is more to spare in the hot weather.

12. Q. (*The President*).—In paragraphs 2 and 3 you suggest a plan for encouraging well irrigation by giving

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Mr. J. Mollison. premiums on good crops. Would it not answer the purpose equally well to give money for wells?—If no interest is charged much encouragement would result.

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13. Q. In paragraph 4 you say, "The Deccan, generally lends itself unfavourably to any large system of canal irrigation and such irrigation is not at present to any great extent protective for various reasons." Then you go on to give five reasons for it. All these objections are financial. It would cost more to get the water on to the land?—It is a question of cost per unit of supply. There are no physical impossibilities.

14. Q. You mean that there are no physical impossibilities, but that it is merely a question of whether it will pay?—It is only a matter of money.

15. Q. (Mr. Higham).—You think the money could be spent better in another way?—Yes, I think if the money were spent on wells it would go further. Canals cost Rs. 200 an acre irrigated. We could do a good deal with that capital in extending well irrigation and do more good.

16. Q. (The President).—Then you mean to say that the canals are worked more for revenue than as public works. That is an administrative matter, Government might arrange their working as it pleases. I mean it is in the power of Government to say that the canal must be worked in this way or that?—Yes, but definite orders one way or the other should be issued to the Canal officers.

17. Q. You say "a cultivator knows perfectly well how valuable canal water would be in a year of drought in saving a crop which might otherwise wither. I should, therefore, make it free to him to water during the kharif season without a moment's delay." Would he not understand that water could be taken when necessary? I thought that Mr. Vishveswaraya told us the application in the monsoon was done away with?—Water is not given without application. Proposals have been made to give definite supplies of water for particular blocks of land in particular villages. Mr. Visveswaraya has proposed, I believe, some such system.

Mr. Ibbetson.—Yes, but I believe the relaxation is limited.

The President.—That again, of course, is not a matter inherent in the canal. It is a question of administration.

18. Q. I do not quite understand Mr. Visveswaraya's "block" system; can you tell us something about it?—He proposes to guarantee water to 200 or 300 acres per village and restrict the irrigation of perennial crops in those areas so that a good deal of water will be available for *rabi* crops.

19. Q. Then, does he propose that the village should confine itself to irrigate this area?—He calculates how much water he can dispense and distributes the water among certain villages; he leaves the cultivators free to divide the water among themselves. He thinks in that way the cultivators will make better use of the water.

20. Q. But he takes it upon himself to say how far the water should go. He does not leave it to the cultivator?—He believes that this system will economise the water.

21. Q. Yes, but supposing a cultivator under this system had water for 10 acres guaranteed to him, would he let him distribute it over 15 acres if he wished to do so?—He gives the village a certain quantity of water and leaves it to the cultivators to distribute the water among themselves. He has no objection to their using the water on an increased area.

22. Q. You say, "I do not think that small tanks in the open plains of the Deccan will be of much use. They will not fill in the rains except in years of exceptional rainfall, and even if full in the rains they will not hold water long in the fair season." Is that so in Gujarat also?—That does not apply to Gujarat but to the Deccan, where there is excessive leakage through muram and trap.

23. Q. (Mr. Ibbetson).—The rainfall in the Deccan is small and uncertain?—Yes, scantier and more uncertain than in Gujarat.

24. Q. (The President).—Then you go on to the question of *bandharas* irrigation. You presume in that case that there is water in the rivers?—I know that there is water in the streams which could be utilized.

25. Q. Has the Government opposed the use of water from the *bandharas*?—The Government has opposed it in a sense, because if the cultivator takes the water he has got to pay for it, I would do away with the whole system of charging for the use of water from *nallahs* and sub-soil water everywhere.

26. Q. It comes to this.—You think that it belongs to the riverain population and not to the population at large?—You give it free for men and cattle to drink and you refuse it to the thirsty land. I would only charge where Government incurs the cost of the *bandharas*.

27. Q. (Mr. Ibbetson).—In the Deccan only or everywhere?—Everywhere.

28. Q. (The President).—You say "I believe that if the people are encouraged to construct wells and *bandharas* throughout the Deccan, in the manner I have sketched, a very full measure of protection against famine will be reached in a very few years". If that were carried out to the fullest extent could you give any idea as to the amount of cultivated crops we might expect to see under irrigation in a bad year?—The present area under *bandharas* is trivial; the well irrigated area is about 700,000 acres. It might in time be doubled.

29. Q. But the cultivable area of the Deccan is 20,000,000 acres?—Ninety per cent. of the cultivable area is unsuitable for irrigation. There are many uplands where the soil is too thin and rocky.

30. Q. (Mr. Ibbetson).—Too rolling?—Yes. I won't commit myself to 90 per cent. If you have $1\frac{1}{2}$ millions of acres under wells this would be the pick of the land of the Deccan and the difference of outturn will be considerable. We would be concentrating our efforts on the best part of the country—the pick of the land—which will produce 4 to 6 times as much as poor soil even without water; add water and you would still further increase this.

31. Q. Would you not store water?—Yes, canals from stored water would help well irrigation by keeping up the water level. In the case of a *bandhara* with a little storage a man would probably protect himself further by building a well.

32. Q. Would you store the water that falls in the hills every year or would you let it flow away?—That is an engineering question. The Engineers can decide whether storage is required. I have not the experience to offer an opinion.

33. Q. (Mr. Higham).—I understand that you deprecate canal irrigation in the Deccan?—Yes, I prefer well to canal irrigation and preferably would like to see well irrigation extended.

34. Q. Although you have an enormous rainfall in the Ghats, no efforts have been made to utilize it for irrigation in the Deccan?—You would do quite as much good by spending the money that it would cost to bring the water down, in making wells.

35. Q. Have you worked it out in any way?—Yes, I think well irrigation is cheaper. A canal costs Rs. 200 an acre and that amount would go a long way in extending irrigation by wells.

36. Q. How many acres would you irrigate for the Rs. 200 applied to the construction of a well?—A Deccan well working 2 *mots* would irrigate 6 or 7 acres and would cost from Rs. 300 to Rs. 400.

37. Q. (The President).—In Sholapur we were told that wells cost a good deal more than that.

38. Q. (Mr. Ibbetson).—You refer to a *kachcha* well?—A *kachcha* well in the Deccan is built so well that the sum necessary to complete it is not a great deal.

39. Q. (Mr. Muir-Mackenzie).—Would you say that such a well would last for an indefinite period?—*Kachcha* wells in Gujarat fall in with rain, but in the Deccan where the base is rock, it only requires masonry built up on one side for the *mot*, and a well so constructed may last indefinitely.

40. Q. What is the area in the whole of the Deccan which could be protected by wells?—At present the maximum area is 700,000, but I should be extremely glad to see the present area doubled. 1,400,000 acres is the limit of possibility in my opinion.

41. Q. (Mr. Ibbetson).—The present area is only about 2 per cent. of the Deccan?—I should say not more than 2 or $2\frac{1}{2}$ per cent.

42. Q. (Mr. Higham).—If you double that it gives only 5 per cent.; that won't keep famine off?—The land thus irrigated from wells would be the best land and would give an outturn of great value in a famine year, and very valuable crops in ordinary years.

43. Q. What about the other lands?—The outturn from the uplands on an average is extremely poor.

44. Q. In order to get more than 5 per cent. something more will have to be done. Wells will not afford full protection, what else do you propose?—I have no objection to canals so long as you do not mind the cost and regulate the distribution so as not to damage the land. A lot of land irrigated by the canals in Poona is going out of cultivation, because it gets excessive irrigation. Give a man a well and you will find that his land will not go out of cultivation.

45. Q. Why do you limit the possibilities of wells to 1,400,000 acres?—The area of low-lying lands with 2 to 4 feet of black soil and muram below limits the increase. I don't think favourable positions for wells other than these can be found. You can put too many wells together in a small area, one well drawing on the supply of another. They must be distributed.

46. Q. (*The President*).—How far apart should they be? Would you say 10 acres to a well?—I think that two wells in the most favourable positions might be put in 10 acres, but it depends on the slope and the catchment. In Junnar and Khed (Poona District) two wells in 10 acres would be perfectly safe.

47. Q. (*Mr. Higham*).—You are afraid that wherever canal irrigation is introduced the result will be the growth of perennial crops by wealthy capitalists and not much protection to the population generally?—That depends on the orders of Government. If left to the Irrigation Department as at present, I don't think there is any likelihood of a change in the system. They attempt to work the canal more for revenue than for protection.

48. Q. The Nira Canal is not worked for revenue; the percentage of cane cultivation is only 8 per cent.—It will extend as the men get richer.

49. Q. It is kept down artificially by conserving the water for *robi* crops?—It is left to the option of the controlling officer.

50. Q. Surely an acre of cane irrigation has great protective value, whether in the hands of capitalist or cultivator, than an acre of dry crop. Supposing you had lots of manure, could you increase the area?—I showed you at Manjhri the extreme limit to which cane cultivation can be got with suitable soil, manure, and water. It is possible to get sugarcane crops under favourable conditions worth Rs. 1,000 per acre which would give 12,000 or 13,000 lbs of *gur*.

51. Q. How much of that is the value of manure?—Rs. 200 an acre.

52. Q. The purchase of that manure must maintain a good many people?—Yes.

53. Q. So that altogether an acre of cane will maintain 4 or 5 more people than an acre of *juari*?—Yes, but for perennial irrigation it is required that a good deal of water should be stored up so that water can be given in the hot weather. That makes it impossible for irrigation to be given freely in the monsoon. Therefore, in a year of drought the crops in that particular year absolutely wither, because a pledge has been given by the Irrigation Officer for a portion of the water nine months ahead.

54. Q. That would not be so if the cane crop was limited to a certain area?—The limit I propose is that those richer capitalists who grow sugarcane should be given water from the canal only if they have a well. If they can afford to buy manure and can afford the other expenses necessary for growing a good crop of cane they can equally well afford to dig their own wells.

55. Q. Supposing you made a condition that before sanctioning perennial crop irrigation in any holding a well should be constructed, would that prevent the full utilization of canal water in the case of a new area?—I do not think that in the sugarcane area of Poona it would have any deterring effect, but with new areas it would limit the utilization of the canal supply.

56. Q. I am not speaking of a deterring effect. If he made his well we should not reserve water for him in the hot months?—That is all very well now, but suppose we had a new work and you said I will not give water unless you have a well; the man might not grow sugarcane at all.

57. Q. From your point of view that is what you want?—What I object to is that so much water is taken up in a year of drought and not given to ordinary food-grain crops.

58. Q. The only practical remedy for that seems to be to have no canals at all or to say that perennial crops must be partially protected by wells?—I have no objection to that.

59. Q. You think that in a new work no one would go in for irrigation on those conditions?—Yes, but in the case of established works the men being capitalists they can afford to build a well in order to continue this profitable perennial cultivation.

60. Q. Of course one point has to be remembered; it is all very well to talk of working a canal for revenue. But there is a limit to money that can be spent without any hope of return, and that if any portion of that expenditure will bring a return, you will have more money to spend elsewhere—Supposing the limit of expenditure of your purely protective works was 100 lakhs, if you can get a return of 20 per cent. then you can afford to spend 20 lakhs more on the works?—That is true, but it would be better to spend the money on wells.

61. Q. (*The President*).—Why should not a man go in for a well for sugarcane on a canal as well as off a canal; you say that off a canal his land is used for other crops; would it not be a greater recommendation for *takavi* if he can go in for sugarcane?—In ordinary seasons he does grow sugarcane on his well, but in a famine year he changes his system and grows fodder and food-grains.

62. Q. I do not see, where a man applies for *takavi* and goes to the expense of digging a well, why he should not do it if there is the extra inducement of canal irrigation to assist him in irrigation. Why do you say that he will not come forward?—I did not say that he will not come forward; I said he might not.

63. Q. (*Mr. Ibbetson*).—With reference to what you have just said about a man who had a well changing his system in a year of drought, it would be just the same if a man grows cane on a well; he could not afford to let the cane go in order to water his other crops during the monsoon?—The result in the Kaira district and generally throughout the Deccan was that all ordinary market garden crops were given up in favour of fodder and *juari* in 1896-97 and in the last famine, and there was an enormous yield of fodder in consequence.

64. Q. By "given up" you merely mean that they were not planted?—Yes, garden crops were not grown.

65. Q. It would be exactly the same on a canal. In a year of drought the people would prefer to grow fodder instead of garden crops?—Yes, that happens on the Mutha Canal.

66. Q. Then so far there is no difference between canal and wells, the change of crop takes place equally on both?—The proportionate area of garden crops under canals as compared with cane is much smaller than under wells.

67. Q. Now, so far as cane goes, is not the well-owner as much bound to give water to his cane as the canal irrigator?—Cane pledges water for a longer period than garden crops and the cane area is less under wells than under canals.

68. Q. You are arguing almost entirely from the Kharakwasla. Are not the conditions exceptional there? There you have an enormous city with rich manure, land close by, and wealthy capitalists who can easily keep an eye upon their investments. Do you think the state of affairs that exists near Poona would spring up if you had the canal far from the city?—The Mutha Canal is a special work; the conditions on other works would not be so marked.

69. Q. How about wells close to Poona; would they irrigate a larger proportion of cane than wells elsewhere?—Yes, probably, but cane cultivators prefer to use canal water, paying for it Rs. 50 per acre. They use their wells only in the hot weather when the canal supply is intermittent.

70. Q. (*Mr. Higham*).—What is the average percentage of cane under wells?—It is very trivial.

71. Q. If a man has 4 acres how much of that would be cane?—A fraction of an acre, possibly.

72. Q. (*Mr. Ibbetson*).—Is the proportion of cane grown under wells in the Deccan smaller than in Gujarat?—Yes, probably.

73. Q. Your impression is that it is smaller in the Deccan?—Yes.

74. Q. As to your preference for wells over canals, you have described the conditions under which wells can be made and worked profitably; and you have also told us of a large area in which irrigation cannot be used profitably. Is there not a considerable intermediate area in which wells cannot be made, but which would be worth protecting by irrigation?—The areas of this class uncommanded by wells are

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Mr. J. Mollison. very considerable in Ahmednagar, Sholapur, and the Southern Mahratta Country. These uplands might be worth protecting.

7 Jan. 02. 75. Q. So that there is a considerable portion which you cannot protect by wells but which can be protected by canals?—The manure question would then come in. It would be a very serious consideration. There is a limit to extension on account of the supply of manure.

76. Q. All that means is, that protection by irrigation from wells is to be preferred because it is slower than canal irrigation?—I think the irrigation of lands manured under wells is more efficient than under canals. Regular irrigation is given instead of heavy waterings once in eight days as is the case with canals. By heavy waterings from the canal the manure is swept away and the soil becomes water-logged.

77. Q. So that as regards that area which can be protected but in which wells cannot be made, your main objections are the fear of the failure of the manure supply, the risk of water-logging, and the consequent salt efflorescence?—Yes, unless the system of canal irrigation is improved.

78. Q. I quite see the danger of water-logging in Gujarat; but with a shallow black soil with muram underneath would there be the same danger of water-logging?—Even with muram below I have seen water-logging in the lower lying areas commanded by canal irrigation. This is due to direct leakage from the canal, and the drainage from over-irrigated high lands to lands lying at a lower level. The result of this leakage may be seen in every *nala* on the G. I. P. near the Mutha Canal.

79. Q. It is not so much the irrigation as the leakage in transit that you fear?—Yes; the loss is enormous.

80. Q. The loss of course is a mere matter of money, the water-logging is not. Supposing that you kept all canal channels full but did not put water on the land, would the leakage from the canal keep the *nalas* running? I want to know how much of this leakage is due to irrigation and how much to loss from the canal?—The *nalas* were usually dry in the fair season before the canals were made. Now they are perennial. The most serious loss is from water-logging.

81. Q. It is the actual irrigation you are afraid of then?—The leakage from the channels is much less than from the irrigated area. At the same time, I would like to state that Poona City is said to be water-logged since the canal was made. I know an instance of a well in the compound of the bungalow of the President of the Poona Municipality which cost Rs. 5,000, where the water level was formerly forty feet below the surface and it now stands fifteen feet from the surface.

82. Q. I want to get you away from Poona, if possible. The comparison between Poona and the ordinary canal is not satisfactory: let us go into the villages. Is there much water-logging on the Nira Canal?—No. The disadvantages produced by water-logging are compared with the great advantages the canal has brought. I went through the valley in 1896-97 and found it green throughout. The advantages of irrigation there are great. I noticed very slight evidences of waste of water and of salt efflorescence.

83. Q. Nothing to constitute a material drawback to the advantages accruing from the canal?—No.

84. Q. You say that the *nalas* run with water leakage from the canal. Does not that show that there is a very effective natural system of drainage?—Yes, that is so, but the railway often interferes with the free flow-off.

The President.—We have heard that stated by several witnesses wherever we have gone.

85. Q. (Mr. Ibbetson).—I should like to have your opinion as to how far it would be safe to apply a strong artificial stimulus to the construction of wells. We are told that many wells made in the famine of 1896-1897 are lying disused, and that many of those made in the last famine will not be used again, and that so long as a man has capital only will he work his well. Would there not be the danger, if you stimulate well work too much, of the people completing them for the sake of the bounty?—There is no doubt that the people have had a very great knock. During the last five dry years the wells did not give a proper measure of their use. I do not think that there will be any risk in stimulating the construction of wells to the fullest extent. After two years of good rainfall the people will come forward. They will not, I feel sure, want to go too fast.

86. Q. You do not think you would outrun the manure supply?—I do not think there will be any risk of that.

87. Q. You don't think people would make wells who could not afford to use them in ordinary years?—No.

88. Q. I take it that in the Deccan and Gujarat a man cannot afford to work a well in ordinary years except for high class crops?—The actual rate of working a single *mot* well exceeds Rs. 100 per acre.

89. Q. You object to canals because their protection is absorbed by wealthy capitalists. Is not that very much the case in regard to wells also?—It is often the case in a time of famine, if the well is a good one, for a number of families to club together. They each supply a proportion of the labour and of the manure and each participates in the profit. This system of co-operation keeps the owner's own family and the others who work under the well off relief work.

90. Q. That is that a man will share well water with his friends?—In Kira in 1899 and in Ahmednagar in 1896-97 that did occur in certain parts.

91. Q. We were told yesterday in Bijapur that such a thing was unknown. What is to prevent the people from doing the same with canals?—Because in my experience the wealthy land-owner, when the pinch of famine comes, throws his responsibilities regarding the maintenance of servants, etc., on to Government.

92. Q. With reference to the working of canals on protective rather than productive lines, to refuse water to cane in ordinary years would mean that the water would go unused?—Yes, the water would probably go unused during the monsoon.

93. Q. Would the people use it for dry crops?—Yes, a good deal for the *rabi* crops.

94. Q. They would wait to see first in an ordinary year if there is going to be a good rainfall?—Yes.

95. Q. At any rate much of the supply would be wasted?—The water could all be used up for *rabi* and garden crops.

96. Q. You believe that if we brought the canal into a suitable tract, we could get all our water used for *rabi* irrigation, wheat, *juari*, etc.?—Yes, these food-grain crops and for market garden crops such as onions, sweet potatoes, etc., occupying the ground between October and March. The water would be used for ordinary *rabi* crops not for perennial crops.

97. Q. Everything but sugarcane?—Yes.

98. Q. You think they would use all the water in ordinary years?—Yes.

99. Q. Supposing you found that they did not, would you then refuse to supply water to a crop of vegetables or cane because you thought the monsoon might fail?—I would refuse water if there was a chance of a bad monsoon in the coming season.

100. Q. If you could not use all your water on other crops would you then give it to cane?—After meeting the demands of the other crops I would give the balance to sugarcane.

101. Q. Now with reference to the royalty Government takes on water used, in the case of the Deccan I quite agree with you. But in Gujarat where only two famines have occurred in 100 years, and where therefore the danger of scarcity is small, do you not think that it is reasonable that Government should take a small contribution for the water used?—Yes, perhaps in Gujarat, but I would certainly exclude the Panch Mahals and other parts where the people are poor and it is advisable to encourage irrigation in every possible way.

102. Q. If I exclude all insecure tracts would there be anything unreasonable then?—For insecure tracts I consider that no water tax should be raised.

103. Q. I am assuming that the principle is accepted in regard to tracts in which relief is commonly needed?—I agree that Government can easily collect a royalty on water in secure tracts without causing hardship, but in Bombay it is not worth while differentiating between tracts which are secure and those which are not.

104. Q. You say a Deccan well can be made for Rs. 300 or Rs. 400, is that a fair average?—For a well of a depth of 25 to 30 feet that is a fair average. The expense in making a *pukka* well is not much more than Rs. 400. Where there is soft soil to some depth the lining would be more expensive. But where there is 3 feet of black soil, then hard muram, and finally trap rock, Rs. 400 is a fair average price.

105. Q. Do you mean to say that such a well would last indefinitely?—I think so.

106. Q. Then why does a cultivator ever go to double the expense?—If the land is alluvial the well has to be deeper.

107. Q. In the Deccan?—Yes.

108. Q. Why do the people go to the expense of making a *pakka* well when a *kachcha* well such as you describe lasts for ever?—*Kachcha* wells which last for a long time are found only where the sub-strata are hard and durable. Many such wells are found throughout the Deccan.

109. Q. Are *pakka* wells built with stone and mortar throughout?—Yes, when black soil is deep it is necessary to line them.

110. Q. (Mr. Muir Mackenzie)—Are the majority of wells you know in the Deccan lined or not lined?—A great many are built up only on the *mot* side.

111. Q. (Mr. Ibbetson)—Now, Mr. Mollison, you were good enough at my request to look at the irrigation in the north of India, and to make enquiries regarding the differences which exist between the extensive canal and well irrigation as practised in the Punjab and North-West Provinces and the intensive system as practised in Bombay. Would you kindly tell us what is, to your mind the main difference between the two systems?—A vast area in the North-West Provinces and the Punjab is commanded by the Ganges and Jumna systems of canal irrigation and by deep and shallow wells in parts where the canal distributing channels do not reach. The ordinary cropped area consists of very deep alluvial soil of very fine consistence and of great natural fertility. The character of this soil is such that after irrigation moisture is retained near the surface for a considerable period. This retentive quality is helped by copious deposition of dew throughout the cold weather and probably the atmosphere in the north of India at this particular season is not nearly so absorptive of soil moisture as in the more southern parts. The practical effect is that a first watering given from a canal or well softens the soil so that preparatory tillage for a *rabi* crop or for an early sown *kharif* crop is facilitated. The moisture remains in the soil until tillage is complete, the seed is sown, and satisfactory germination has occurred. Subsequently two waterings from a canal or three or four from a well is sufficient to bring a *rabi* wheat crop to maturity. This crop mixed with rape seed or gram is the chief *rabi* crop grown. The total cost of leading the water over the field for the first watering, in laying out beds for irrigation, and in applying the water is very trivial. It does not exceed 8 annas per acre. The distributing channels are made of puddled soil. They allow no leakage of water. The surface of the fields is even; the water in large volume is easily distributed; therefore the cost of the first watering is small. The villagers have the usual number of work and breeding cattle and milk buffaloes of any ordinary district. The dung of cattle, the litter and the household waste is carefully preserved. The manure heap which each occupant thus accumulates provides the only manure applied to the irrigated fields. It is a very light dressing; owing to the character of the soil and lightness of the irrigation, this light dressing of manure on an irrigated crop is quite as effective as if the soil was kept moist by timely showers of rain. There is no difference in effect whether the irrigation is by flow or lift from canals or by lift from deep, medium or shallow wells. The contrast between this system of irrigation and cultivation and that necessarily practised in the Bombay Presidency is very pronounced. Medium black soil with murum below (the best black soil to irrigate in the Deccan) dries so quickly between waterings that irrigation is required every 8 to 10 days. The *goradu* (sandy loam) soils of northern Gujarat are so absorptive and dry so quickly that irrigation is required in the fair season every five or six days. Such irrigation is exceedingly expensive from wells owing to the cost of raising water. Heavy dressings of manure are required on the limited areas irrigated because owing to cost of lifting water only very good crops will pay. A really good crop can only be produced from good soil by regular irrigation and heavy dressings of manure. Unfortunately the heavy and continuous irrigation washes much of this manure into the sub-soil and the crop only takes up a certain proportion. With this intensive system of irrigation a single *mot* or *kos* (leather bag) will only lift water from the deep wells of Gujarat for an area of about two acres and from the shallower wells of the Deccan for an area of three and a half to four acres. In the Hissar, Delhi and Rotak districts of the Punjab I have seen deep, medium and shallow wells at work. I have found deep-wells, the masonry construction of which extended to a depth of 110 feet, with depth to water of 60 to 70 feet, irrigating each six acres of wheat or barley; medium depth wells 30 to 40 feet deep, irrigating 8 or 10 acres per leather bag, and on the riverain land, wells with 20 feet depth to water irrigating 12 to 14 acres each. The very deep wells were this year worked very

hard because the *kharif* crops owing to deficient rainfall failed, and there being no means of canal irrigation the people depended upon the wells. Relatives or families joined together to participate in the profits of irrigation, jointly finding all the manure and labour required to produce the best results. The same practice occurs in the Deccan and Gujarat in a famine year. The natural fertility of the Ganges-Jumna alluvial soils may to some extent be gauged by the fact that on soil of this class in the Cawnpore Government Farm irrigated wheat has been grown since 1881 without manure and the crop of 1900 yielded, approximately, of grain per acre 1,200 lbs. from one plot and 1,400 lbs. from another. It may also be gauged to some extent by the fact that in the Hissar district in the current year (a season of unfavourable rainfall) land irrigable by lift from the canal is freely rented out at Rs. 15 per acre for the year or at Rs. 10 to 11 per acre for one crop. Tenants pay in addition all irrigation charges. The canal water is only lifted a few feet and irrigation therefore is not costly. In the same district I found land irrigated from a well with depth to water about 60 feet rented at Rs. 8 per acre. It is not unusual to take a *kharif* as well as a *rabi* irrigated crop in one season under canal irrigation, but it is more common to depend upon one good *rabi* irrigated crop or in a year of favourable rainfall on one good dry crop only. If the latter requires to be once irrigated to bring it properly to maturity, the charges for canal irrigation is 12 annas per acre and, as already stated, the cost of applying the water is trivial or negligible. The rates for canal water in the district inspected vary up to Rs. 5 per acre for sugar cane, Rs. 2-8 for wheat, 12 annas for a single watering, and half rates for water lifted from canal. I considered that approximately accurate returns were more freely admitted by the actual cultivators than in Bombay; and from data communicated, I believe that the grain from an acre of canal irrigated wheat crop would ordinarily exceed Rs. 30 per acre, and of well irrigated crops considerably more. In the case of canal irrigated land excluding cost of light dressings of manure (the actual value of which can only be approximated) other expenses including assessment could not possibly exceed Rs. 16 or Rs. 17 per acre. The only risk is damage by rust, and that is inconsiderable.

112. Q. Gujarat is essentially a monsoon or *kharif* crop country; is it not, except for cotton?—Yes, except for the extensive wheat and cotton crops in Ahmadabad and Broach, Gujarat is a *kharif* province.

113. Q. Putting aside the wheat and cotton tracts the whole of the remainder is *kharif*?—Yes.

114. Q. On the other hand the Deccan, broadly speaking, is a *rabi* province?—Those parts of the Deccan and Southern Mahratta lying inland and some distance from the Ghats are chiefly *rabi*. The western talukas of Poona, Nasik and Khandesh are chiefly *kharif*. In the eastern black soil parts of Dharwar crops of cotton and *juar* are sown between the two monsoons.

115. Q. What period is that?—In Dharwar cotton can be sown in September or as late as October, as it gets the north-east monsoon.

116. Q. Can you give me any broad reason as to why one province is *kharif* and the other *rabi*?—It is entirely a question of rainfall. In Sholapur and Nagar and the eastern talukas of Poona the important rain is the late or *rabi* rain. The character of the soil is such that if you have a good late rainfall, the *rabi* crop grows particularly well. In Sholapur and Ahmednagar with heavy October rain there is a good *juar* crop.

117. Q. Except in the tracts under the Ghats, I suppose very little rice is grown in the Deccan?—Practically no rice is grown in the Deccan, except under the Ghats, but some is grown in the western talukas of Belgaum and Dharwar.

118. Q. I suppose that is because the rain is lighter and the soil is not suitable?—In the Ghats there is a rainfall of 150 inches more or less, which rapidly diminishes till it is only 30 inches in Poona and 20 at Ahmednagar. The rainfall is small away from the Ghats.

119. Q. That explains the absence of small tanks?—Yes, they would not fill.

120. Q. We are told that people here will not take water from a tank because they only get it for a certain portion of the year. They have the idea that if a dry crop is given water once, you must go on giving it water. Does that feeling exist and is it based on any reason?—I doubt if those are the true facts. I should put the refusal to take water down to various reasons. The soil may be unsuitable.

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Mr. J. Morrison. the tank may not fill well; the occupants of land under the tank may not be good cultivators. When water is refused from a tank, I should say previous enquiry before the tank was built, if properly conducted, would have accounted for it.

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121. *Q.* You are far away from my point. Take the case of a canal, well established, irrigating sugarcane and garden crops; in a year of drought the water will be used for dry crops, but in ordinary years the cultivators would refuse to take water for them because he is not guaranteed a supply throughout the season. Do you think in a tank supplied from a permanent source we should find the same difficulty in disposing of the water?—I should say there would be.

122. *Q.* If we could get the supply from a permanent source would the people begin to use water in ordinary years for dry crops; supposing there was plenty of water, more than they could use for first class crops?—In the case of a tank containing perennial storage I doubt if the water would be used even if the supply is guaranteed. For *juari* only one watering is required and the cost of leading the water up to the fields is considerable and would have a deterrent effect.

123. *Q.* Yes, but if from the same cut he could get several waterings, is he likely to use the water?—For one watering it costs Rs. 4 to Rs. 5 for making channels.

124. *Q.* Though the cost would be the same whether he took one watering or half a dozen?—He would rather have one watering.

125. *Q.* You don't think that on a tank where the supply is liable to failure, the people could be induced to use the water by making the supply permanent instead of uncertain?—I don't think there would be much difference as regards their taking water from a tank with a limited or a permanent supply.

126. *Q.* Supposing you have a canal, with plenty of water and a permanent supply assured, which commands a large culturable area, what would be the maximum proportion of high class crops likely to be grown on an ordinary Deccan tract, supposing that you have manure and labour?—Probably not more than $\frac{1}{3}$ th would be under high class crops in an ordinary Deccan tract.

127. *Q.* You told us in Gujarat that one *mot* on an ordinary well would irrigate 2 to 2½ acres in ordinary years or twice that in bad years if the water lasted out, would the same figures apply to the Deccan?—With Deccan wells 3½ to 4 acres may be irrigated at one time. The area, however, would not be doubled in a bad year, but would be increased.

128. *Q.* You would not double the area in the Deccan in a dry year?—No, the water in the deep alluvial wells of Gujarat does not sink soon. In the Deccan the wells sink sooner than in Gujarat.

129. *Q.* Many of your best well tracts are in black soil; is the black soil more than 3 feet deep in the Deccan?—The black soil is 3 feet or 4 feet at the most. At this depth it can be irrigated. If it is deeper the soil deteriorates with watering. As a matter of fact there is loss on wells in such lands.

130. *Q.* Can you tell us the cost of repairing a well in the Deccan?—I cannot give the figures. The people do not have to do much in the way of repairs besides silt clearance, etc.

131. *Q.* A well does not need much repairs?—No.

132. *Q.* You speak in your note of the rayat being prevented from using canal water when the crop is in danger of

drought owing to permission to take water being necessary. Have you seen the results of this at any time. Have you any personal knowledge on the subject?—Yes, I have seen the results at Poona near our farm. In 1899 the people did not apply for water till they actually saw their crops withering; then they applied for water, but could not get the permission in time to save their crops. On the Kirkee Farm we had a *kharif* crop and three waterings were found necessary. We wanted a first watering at once and we took it, formal sanction being obtained afterwards. The crops grown compared favourably with those of ordinary years and as market rates were high were worth double as much as usual, while all the crops round about perished.

133. *Q. (Mr. Muir-Mackenzie)*—Do I understand that you got the water before you got the sanction?—Yes; if we had waited for the permit the farm crop would have been past saving. We got the water by arrangement with the Canal Department and got the formal sanction afterwards.

134. *(Mr. Ibbetson)*—I understand that you know as a fact that other people did apply for water but were so late in getting the permit that the crops died?—Yes that is so, but they waited till the last minute before applying.

135. *Q.* As to your proposal not to give canal water for cane unless a man digs a well; is it not waste of water to give canal irrigation to a field already protected by a well?—The profits from canal irrigation are found greater in the case of expensive crops than from wells, so the cultivator takes canal water for nine months and uses his well for the remaining three.

136. *Q.* But why allow him to do so? The area he can cultivate is limited by the capacity of the well, so that he can irrigate it from the well all the year round?—I should like to see it done in the new canals.

137. *Q.* These *bandharas* which you recommend to be extended; would you build masonry dams or would you allow the people to build *kachcha* dams and let them be washed away in the monsoons?—I would let them build them as they like. Big *bandharas* built with masonry would be more substantial.

138. *Q.* If Government built the *bandharas* it would charge for the water, of course?—Yes.

139. *Q.* Do you think the people will begin with *kachcha bandharas* first and when they get used to them they will build *pakka* ones?—Yes, Government might build the *pakka* ones, but there would be no necessity for this if Government do not charge for the water.

140. *Q.* You propose that the water should be given free of charge?—Yes, I would like to see each taluka carefully and thoroughly surveyed. Any costs incurred in surveying might, I think, be charged to the cultivators.

141. *Q.* If all the *bandharas* possible were made would they irrigate anything like the area commanded by wells?—The area under *bandharas* would be small compared with the area under wells.

142. *Q. (Mr. Muir-Mackenzie)*—Do you think that money could be usefully spent in extending the number of *tals*?—I really have not sufficient experience of *tals* to give an opinion. You ought to accept local experience in preference to mine.

143. *Q.* In Ahmednagar did you notice whether the land behind the *tals* had given crops?—I did not notice them particularly.

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Answers to printed questions.

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2. There is only a small portion of land protected by irrigation works of all sorts in this district, probably not greater than $\frac{1}{10}$ th of the total culturable area. The soil of the district is either black, red, or muramy and to a small extent alluvial, and is almost wholly dependent on rain-water. Besides the small area under well and other irrigation, there are patches of land here and there on the banks of the Krishna and its tributaries, which derive benefit from inundations during rains. Rainfall in this district varies from 20 to 36 inches in good years. In years of scarcity it is below 20 inches. During south-west monsoons, when the fall is regular and sufficient, there is no demand for water for *kharif* or early crops. The *rabi* crops, however, require cold weather showers from the east from September to November. Garden crops require watering once in four to eight days according to the nature of the crop.

3. Black soil is hard when dry, but when wet or soaked in water it becomes soft and yielding. It affords a medium impervious to water when moist; when exposed it is liable to shrink and crack. Small tanks constructed in black soil hold water. They, however, require clearing of silt from time to time and removing any *babul* or other trees growing on the dam. It would not be safe to construct high earthen dams solely with this soil even when supplied with masonry core walls. Black soils generally produce *rabi* crops, and require seasonable showers in the beginning of cold weather. The average rainfall may be all right, but if the fall be not in season crops in black soil may fail. Construction of tanks for such soils is not as important as for other classes of soil.

4. There is an old tank at Mandapur near Bijapur, constructed during Mahomedan rule and serves to irrigate

about 100 acres of paddy or other lands. The only other tank in this district is the tank at Muchkundi near Bagalkot, constructed in 1882. It has a masonry dam about 300 feet long, and 60 feet maximum height. This tank also serves a small area, but owing to some cause or other it has not yet proved to be a success, and cannot be depended on during years of drought. There are two other irrigation tank works in progress in this district as famine works, *viz.*, the tanks at Sangogi and Hullur. They are both to have earthen dams, and when completed are likely to prove a great boon to this district. The main river passing through this district is the Krishna with its tributaries Ghatprabha and Malprabha. The river, which has only a small flow in the hot season, is about half a mile in width, and has high banks. The country about the banks is elevated. Under these circumstances it is highly improbable that its water can be used for permanent irrigation. Something, however, may possibly be done to take advantage of the high level of water in the river during the rains. It may be stated that when there is failure of rain, and probably famine in this district, there are generally high and sometimes extraordinary floods in the river Krishna and its tributaries.

7. I do not think there are more than 1,200 irrigation wells in this district and that each well on an average irrigates more than four acres of land for garden or other crops in ordinary years. In the years of drought the area would be still less owing to low water level in the wells. So far as I am aware, no higher assessments are charged for lands irrigated by new wells constructed at rayat's own cost. It is both possible and desirable to stimulate the construction of new wells by liberal advances, and inducements from Government. Wells are sometimes failures, and it would perhaps be desirable to select for their sites particular banks of nallas where water is abundant, and in the first instance to construct *kachcha* wells at small cost, and when they are successful to turn them into permanent wells. A large number of wells failed during droughts from 1897 to 1901. Where subsoil was muram they have been deepened with advantage. The average depth of water below surface ranges from 20 to 30 feet. When the water level is below 30 feet, working of the wells becomes costly. The cost of wells depends on their diameters (when they are circular) or square area, depth, nature of sub-soil, cost of materials and the kind of construction used. For a well 10 to 12 feet diameter and 25 feet deep with dry stone steining, the cost need not be more than Rs. 300 when the stone is within easy reach. For large wells 20 to 25 feet square, the cost may be Rs. 2,000 to Rs. 3,000. In hard muramy soil requiring no steining, except for a few feet at top and below mouth, the cost of large wells may be brought down to Rs. 300 to Rs. 400. A single well may, according to its size and energy of springs in it, irrigate from three to twelve acres of land.

8. In this district there is hardly any complaint of excessive moisture in the sub-soil as far as crops are concerned.

9. Relief labour was employed in the recent famine on—

1. Roads.
2. Road-metalling.
3. Irrigation tanks.

I do not think much has been done in the way of construction or repair to village tanks. The two irrigation works, *viz.*, the tanks at Sangogi and Hullur, at present in progress as famine works, should, in my opinion, be continued and completed as ordinary works, not only to save from waste the large amounts already spent on them, but to serve as protective works during possible famines in future. Both the tanks are said to have large catchment areas of several square miles and to command extensive areas for irrigation under them. There is only one fear, and it is that the tanks in black soil districts are likely to be filled up with silt in course of time. This point, however, may have been fully considered in fixing the position of the outlet channels in the preparation of the projects.

II.

A.—GENERAL.

Question 1.—The answers below refer to the Bijapur District. I have served in this district as Assistant Engineer, Public Works Department, about nine months during the famine of 1876-77, and for a further period of

about ten months from 1881 to 1882, and have, since my retirement from Government service on pension in January 1895, resided here, engaged in agricultural pursuits.

Mr. Tilak.

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5.—Loans under the Land Improvement Act are to a small extent availed of by the people for irrigation purposes. The reason why they are not freely taken is that the cultivators do not care for irrigation in years of plenty, and when a drought comes they are already reduced to a state of poverty and helplessness and have no heart or energy to start a new undertaking, with the details of which they are not fully acquainted. Only rayats of means think of well-irrigation chiefly to produce green grass and fodder for their bullocks, the pinch of the famine being first felt by the live stock. To encourage well irrigation a beginning may, I think, be made in a good year, concessions being offered to rayats under one or the other of the six sub-heads to this question according to circumstances, and progress watched by the Revenue officers during their tours of inspection.

E.—WELLS.

34.—(1) The average depth of permanent irrigation-wells in this district is 25 feet in alluvial soils on the banks of nallas including about 5 or 6 feet depth of water and 35 feet in hard soils on sites at some distance from the nallas, including about 8 feet depth of water.

(2) The supply is from percolation in alluvial, sandy and soft muramy sub-soils and both from percolation and springs in hard soils.

(a) In an ordinary year wells keep up their supply and the water is sweet.

(b) In a year of drought the supply sometimes fails, but the water does not necessarily become too saline to use.

(3) The average cost of construction of wells with areas not exceeding 150 square feet and depth 25 to 30 feet is from Rs. 400 to Rs. 500. Large wells about 20 feet to 25 feet square, and 30 feet to 40 feet deep cost from Rs. 2,000 to Rs. 3,000.

(4) Wells when properly constructed, may last more than 100 years.

(5) The water is usually raised by means of a leather bucket (*mot*), ropes and wheel, worked by a pair of bullocks.

(6) Small wells command an area of 4 to 8 acres; large wells with 2 or more *mots* 8 to 16 acres.

(7) A small well irrigates on an average 4 acres of land, while a large one about 8 acres.

35.—Well irrigation in most parts of this district is in its infancy and is merely a useful appendage to other valuable lands, serving in years of scarcity to supplement fodder of good quality to a small number of selected live stock. It is not, as a rule, resorted to as a separate avocation, and is not a paying concern when all costs are taken into account.

36.—An acre of irrigated land with sugar-cane, plantain, or other valuable crop may, under favourable circumstances, yield a produce worth about Rs. 5' against Rs. 4 or 5 of similar land depending on rain water. Much, however, depends on experience and skill and lastly good luck of the man employed, as the crops are sometimes subject to the ravages at the hands of merciless thieves.

37.—No higher rate is charged for well irrigation.

38.—Serious difficulties are encountered—

(1) In the selection of a spot in which ample and lasting supply of water is found. Wells when first constructed often yield plenty of water, but when worked for a few months they sometimes fail. In some cases excavations have to be given up as hopeless, as no signs of nearness of water appear or hard rock is met.

(2) Difficulties occur in the construction of a well when the excavation has to be carried through sand or other treacherous soil. Square wells built in such soils at great cost sometimes fall down, and to re-build them is a tedious task.

No professional assistance has, to my knowledge, ever been either sought for by the parties concerned, or offered by Government or local bodies. It would be an advantage

Mr. Tilak, if assistance in respect of expert advice, trial borings and the use of boring tools and pumps be within the reach of well-to-do rayats wishing to undertake well construction and requiring such assistance.

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39.—I am in favour of construction of wells in private lands by Government, in special cases, as models in spots not yet tapped. I think a regular survey of large nullahs for some distance from their junction with large rivers will have to be made for this purpose and plans prepared, showing under-ground water levels at every $\frac{1}{4}$ th of a mile to a depth of 25 feet from the surface of ground. The model well should be sufficiently deep to hold water during years of drought, and its construction should be as sound and economical as possible. The success of this well may

be the means of encouraging well-to-do people to build others in their own property. People may be allowed free use of water from this well for irrigation purposes at least for a few years.

40.—Temporary wells are used in this district as a forerunner to permanent ones. They are also resorted to in years of drought. I would encourage their construction in a year of scanty rainfall by offering to supply from public funds, free of cost, all appliances and materials, such as wood-work for support, stone for the trough, leather bucket and wheel, etc., leaving the excavation only to the cultivator. These wells will probably cost Rs. 50 each, including materials and toil, with small repairs, last two or three years.

1. Q. (*The President*).—You are a retired Executive Engineer?—Yes.

2. Q. You were Assistant Engineer during the famine of 1876-77 and you retired in 1895?—Yes.

3. Q. You are a landowner; where is your property situated?—I own 350 acres in the Muddebital taluka of Bijapur.

4. Q. With your knowledge of this district what do you recommend as the best means for preparing it against another famine?—Well irrigation should be encouraged in the first instance. But there is another suggestion which I would like to propose and which I think has not been mentioned by any other witness. The new method I would propose is that each village should keep a small stock of grain and in a year when the quantity of rain is very small a little of it should be given to supply the immediate wants of the people. In this district crops fail for the want of one timely shower of rain. The fall of one shower means prosperity; the failure of one shower leads to misery. The people are seldom prepared. Their immediate wants are fodder and grain. If there was a stock to last even for two months they would have time to think of what they might do. At present their stock just fails in a famine year when they want it most and they have no time to prepare for contingencies. I think that just as Government spends money on relief works they might spend some in the way I suggest.

5. Q. Would you make the rayats pay for this grain or would you take it out of Government dues?—I suggest that part of the assessment should be taken in kind, two annas from the annual assessment for grain and one anna for fodder for two years only, and this should be kept in the village. It would be just like Government keeping a large cash balance. There will be a certain amount of grain and Government could turn it into money, only the interest would be lost. This would be distributed amongst the various villages and each village in two years will have about Rs. 500 worth of grain. There are special sites in many villages for storing grain where it could remain without damage for ten years.

6. Q. What would you do if you had it there for two years and no one wanted it?—Corn lasts without losing any of its good qualities for two to four years and I should ask the rayats for whom I store this grain to change it for new grain every two or three years.

7. Q. And fodder? What about that?—Even fodder can be kept.

8. Q. Do I understand you to say that this store would be given out in times of famine and drought just as now we give out payment for famine labour?—In a year of drought I would distribute it only to the poorer people.

9. Q. The rayat pays his assessment in cash as before and receives back a certain sum indirectly to help him in times of distress?—The rayat would have to pay 14 annas in cash and two annas in grain. The latter would be issued by Government as a loan in hard times. What happens at present is that the poor rayat goes to his neighbour, and if he also is in want he goes to the Sowcar who demands two bags of *javari* for the one he lends, when the crop is harvested. If the crop is a good one the man can easily repay two bags for every one bag he has taken, but if it is middling he

cannot afford to give two for one and he is worse off than before if he gets no crop at all and cannot return the loan.

10. Q. You want the Government to be a sort of corn banker?—Yes, I have heard one objection to my plan, and that is that it will be difficult to keep a watch over the grain. In this district there are grain pits six or seven feet below surface and it is not possible for robbers to get the grain out of such pits in one night. It takes at least twelve hours to get down to any of the pits and even if the pit is exposed it takes a lot of time to get the grain out as the mouth of the pit is very small. It is an excavation in hard moram 6' x 6" of globular form at the bottom and reduced to a funnel at the top. It requires no cover other than a slab and no guard and would be outside the villages. The village authorities might, I think, be held responsible for the safety of these grain pits and fodder stacks. The storing of fodder would result in the preservation of a certain number of head of cattle which are required for the cultivators' operations.

11. Q. What is the best way of raising crops in a famine year?—By wells in this district; large tanks would also be a good means.

12. Q. But you have a large tank and no one takes any water from it. Do you know the Muchkundi tank; that irrigates only 40 acres although it could irrigate considerably more?—I have seen the tank. I had only one or two water supply projects before me when I was in the service.

13. Q. You know the Sangogi and Hullur tanks; how much money has there been spent on them?—About Rs. 80,000.

14. Q. How much remains to be spent?—Only the excavation pits have been dug.

15. Q. Supposing ordinary labour had been put in the tanks instead of famine labour, would Rs. 80,000 have been spent?—No, only about $\frac{1}{4}$ th of that sum.

16. Q. You say temporary wells can be made for Rs. 50. What can you do for Rs. 50?—We can excavate a pit 20 to 25 feet deep for Rs. 50.

17. Q. Will it last long?—It might last 2 or 3 years, if there are not heavy rains.

18. Q. Do you find water at 20 feet?—Yes, on banks and nullahs.

19. Q. (*Mr Muir-Mackenzie*).—Have you any *tals* on your lands; and do you find that your lands are protected by these *tals* and that you get better crops by means of them in years of drought?—Yes, there are *tals* on my lands; I get better crops only on those portions which go under water.

20. Q. Is that a material portion?—About 10 per cent of the area.

21. Q. Why do you build your *tals*?—To prevent the water from running out and to give moisture to the fields.

22. Q. Does it give you a better crop in ordinary years?—When there is plenty of rain they are not of much use, but in times of drought *tals* are very useful.

TWENTY-NINTH DAY.

Belgaum, 9th January 1902.

WITNESS No. 75. MR. RUDRAGAUDA CHANVIRGAUDA ARTAL, District Deputy Collector, Belgaum.

Answers to printed questions.

I.

2. *Cultivable and Irrigable Area*—The cultivable areas of the Belgaum District is 2,224,283 acres.

The following are the proportions of the cultivable areas to irrigated areas:—

Area irrigated from—

	Acres.	per cent.
Government canals	4,507	or .20
Wells	29,695	1.33
Tanks	9,079	.40
Other sources	6,899	3.1
TOTAL	50,180	2.25

The character of the soil is *Masari* (red), *Karla* (clayey loam) and *Yari* (black).

Rainfall.—Near the Sanhyadris the rain of the south-west monsoon is very constant and heavy (Belgaum and Khanapur). Further east (Chikodi, Gokak and Sampgaon) it is fitful. The eastern talukas show a fitful fall, but this is supplemented by a scanty supply from the north-east monsoon (which comes generally in October or later). Ordinarily there is no demand for water in the south-west monsoon. The crops which generally require irrigation are sugarcane, betel leaf, turmeric, onions, garlic, vegetables (root, leaf and pod), plantain trees, "Javi Godi," etc. They require watering once a week or once a fortnight at least. The area under a crop is divided into parts each of which is watered at a time. The irrigation revenue is generally realized in the form of a consolidated assessment in the case of tanks. In case of canals of continuous flow (Gokak canal is the only canal of this nature in this district), the revenue is levied in the form of a separate water-rate.

3. *Black Cotton Soil.*—As far as I know, black cotton soil is of little use for extending irrigation. Ordinarily the garden crops, such as onions, garlic and a few vegetables, may grow, but for betel leaf gardens, for plantain trees, etc., which require ample water, the soil is useless.

Small tanks constructed in such soil hold water only for a short period—say, till the end of December, unless early rains are heavy—and it is not at all sufficient for an extensive irrigation. Generally the water is used by men and cattle for drinking. High earthen bandhs or dams cannot be made of such soil without masonry core walls, unless perhaps the dams are very wide at the base.

Black soil has a great moisture-retentive power and hence there is no demand for water except in case of prolonged drought.

There is no desire on the part of owners of black soil for irrigation.

4 and 5. For the description and the number of irrigation works I have nothing to add to what is so elaborately described in the pages of the "Bombay Gazetteer," Belgaum, Volume XXI, pages 240 to 244.

6. I have not the requisite statistics of the district or village works. Government have not as yet clearly been given to understand the extent of their responsibilities to maintain these works. No settlement report gives any information about these. In a year of scanty rainfall these works naturally fail to be as useful as in ordinary years; yet I do not think that any remission has been granted or claimed by the rayats. The case of Gaddikeri at Mugutkhan-Hubli may be mentioned as an example. The District Board have not done any irrigation work. The Local Boards, as at present constituted, will not, I think, be able to undertake these works. I am of opinion that the protective value of these works will be greatly increased if more money and greater attention to their upkeep be paid than at present and a few rules be made for this purpose. It will not be quite uncustomary if the rayats who are directly benefited by these works be made to work or provide labour for their ordinary repairs or clearances for three or four days during a year. Their value for domestic purposes depends upon their situation.

7. I have not the statistics to date. The opinion I hold respecting the wells is given in answers to another set of questions.

8. No drainage work is necessary in this district.

9, 12, 13 and 14 I have not the requisite statistics to enable me to answer these questions with any degree of accuracy.

I may add that the works on which relief labour was generally employed in this district were road and earth-works and metal-breaking. I think that of the works remaining uncompleted, those of Saundatti-Dharwar and the Murgod-Bail Hongal Roads require early completion, as otherwise it will hinder the traffic between the places and the works will prove of no use to the public.

II.

A. General.

1. My answers particularly refer to Parasgad, Sampgaon and Khanapur Talukas of the Belgaum District and generally to similar tracts of the rest of the Belgaum District and of the Dharwar and Bijapur Districts. I have visited several places during my last 25 years' service in the capacities of clerk, Deputy Chitnis and Chitnis to Collectors, of Native Assistant to the Commissioner, S. D., and of a Divisional Officer. Besides, I own paddy fields in the Dharwar District. I have also seen almost all the tanks in the Belgaum, Dharwar and Bijapur Districts.

2. The rainfall varies much in different parts of the three talukas. The average for Sampgaon which is situated between Khanapur and Parasgad is 29.89, that for Parasgad 24.78, and for Khanapur 67.27 inches. I was able to collect figures of the average rainfall in each month of the year for the Sampgaon Taluka only. They are as follow:—

	Average of 10 years from 1891 to 1900. Inches. cents.	
January	Nil.	
February	0	5
March	0	33
April	2	41
May	2	61
June	5	55
July	5	32
August	3	88
September	3	25
October	4	89
November	0	58
December	0	9
Total	28	96

3. The circumstances and conditions of the talukas vary so much that the same reasons do not apply equally to all parts of the same talukas. Obstacles Nos. 1, 2, 3, 6 and 7 do not exist in any of the talukas. Unsuitability of soil is met with in the Parasgad Taluka. Only in the deep black soil continuous irrigation has not proved advantageous. The fifth obstacle exists in Sampgaon and Parasgad Talukas, while in the Khanapur Taluka the rain is generally seasonable and sufficient. In the case of irrigation by erecting dams across nallas, this obstacle is less as the supply of water hardly runs short in an ordinary year. Obstacle No. 8 exists in alienated villages in which the Inamdar has power to rack-rent his tenants. I think that a law providing the maximum rent to be recovered from the actual tillers of land may be enacted in case of alienated villages. Among "other reasons—(9)" the prominent ones are want of expert opinion and lack of capital and unity among the cultivators to utilize improved means of irrigation.

4. I do not know of any such exemption granted. (3) Nearly all the tenants in my charge are tenants-at-will and they do not effect any material improvements in irrigation at their own cost. (4) Section 107 of the Land Revenue Code adequately protects against any future enhancement of revenue, having regard to improvements effected in any land during the currency of any previous settlements at the cost of the occupant or the holder.

5. The loans are applied for frequently, yet I found very few cases in which any extension of irrigation was really

Mr. Artal.

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Mr. Ardal. attempted. I can, however, give one example here, that of Sir Desai of Shirsangi, Taluka Para-gad, who has constructed by the aid of a tagai grant of Rs. 75,000 a large tank near Shirsangi in order to extend irrigation to lands in two or three of his Inam villages. This is, of course, a case of a big landholder. But to create a real taste for irrigation among the ordinary rayats I would propose that in selected villages special measures for the encouragement of these loans should be adopted. In case of new lands brought under irrigation by means of wells only interest at a lower rate, say at 3 per cent., may be charged, and if through a deficient supply of water or for other good reason the undertaking proves a failure interest may be remitted altogether. The period of repayment does not ordinarily call for any extension. I would also propose that in case of tanks remission of interest may be granted in a particular year in which crop suffers for want of adequate supply of water. I am of opinion that special encouragement by means of grant-in-aid or otherwise may also be given in case of large and speculative works, such as large tanks, wind-mills and utilization of river or of stream water by means of machinery, etc.

6. I have not come across an instance of this kind.

(3) The cultivators of course want the means of irrigation extended provided the cost is not prohibitive.

7 to 11. There are no canals of continuous flow in this charge.

12. After the cessation of rains small earthen dams are thrown across some perennial nallas at selected sites and water is let into the fields by means of channels. In the Khánápur Taluka, where the early rains are certain, sugarcane plantations are fed by water baled out from these temporary reservoirs. The dams are generally washed away in June.

(3) The period depends upon the nature of nala and the crops raised: in a year of ample rainfall the supply lasts till about the 15th of March. In a year of scanty rainfall it lasts till the end of November, and in a year of drought there is scarcely any water sufficient for irrigation purposes.

13. The mode of irrigation described above enables a cultivator to raise valuable crops, such as sugarcane, garlic, onions, green vegetables, etc. In a year of scanty rainfall green fodder or its substitute, maize, etc., is raised. These lands are generally of a medium quality. I cannot give with accuracy the value of the irrigated and unirrigated crops.

14. As an irrigated crop mainly depends upon water, the entire crop withers as the supply of water ceases or if it cannot be properly maintained.

15. In the case of garden lands irrigated by means of canals described above the irrigation is almost always supplemented by wells, particularly during the period from March to June. In the case of sugarcane crop raised in the Khánápur Taluka well water is never used.

16. I cannot give figures.

17. The canals I have described are not many and none of them are more than 300 or 400 yards in length. The owners of the fields are generally the owners of the canals. Government have fixed a consolidated assessment on these lands. It is for the Survey Department to mention what amount of irrigation revenue has been levied. The farmer or the owner generally gets $\frac{1}{2}$ to $\frac{2}{3}$ of the gross produce on the land actually irrigated.

18. The expenditure necessary for the kind of irrigation is the cost of dams which varies from 10 to 50 rupees and the charges for the up-keep of the channels which the tenants maintain.

19. No such instance has come to my knowledge.

20. *Vide answer to questions 17 and 18.*

21. All these canals or dams are constructed by private persons. Disputes with regard to them are very rare.

22. I am of opinion that construction of these canals or channels should be encouraged as much as possible and proper record kept of them. If possible, dams may be erected *pakka* with a large sluice for the rain water to escape during the monsoon. At present the greatest defect is that no records of such works and of the lands irrigated by these means are kept, and the supply is not well regulated. I think Government should assist the cultivators by providing the services of a professional man who should take level and inform the cultivators whether water from a selected spot could flow to his field, etc. Besides this,

Government can remit the water-rate leviable under Section 55 of the Land Revenue Code and give advances without interest. It so happens, particularly in years of drought, that a riparian occupant cannot obtain in time the permission of the Collector to use the water, and the consequence is that his crops fade away and parch. I think that in such cases the people may be allowed to take water freely and save their crops. In such cases the Collector should issue general orders permitting the free use of such water.

D.—TANKS.

23. Tanks are made by bunding or arresting the flow of a nalla or a watercourse in a convenient place by means of earthen dams erected crosswise. The site is generally such as to command the largest catchment area and is on a high level, so that water from it may flow easily to all the low-lying lands. Each tank is generally provided with one or two sluices which supply the fields with water. One waste weir which gives passage when the tank is full and one main conduit which supplies the tank with water from the adjoining country fulfil the requirements of an ordinary irrigation tank.

No perennial irrigation is carried on under these tanks. They are intended to furnish the paddy crops with water when the rains hold out, and in case the rain be ample to provide water for sugarcane cultivation in the months of March, April, and May.

In a year of ample rainfall the water is generally used for sugarcane crop which requires from four to five waterings with an interval of about a fortnight to 20 days between every two waterings. The supply therefore is made to last till the end of May. In a year of scanty rain the water or part of it is generally used for growing paddy crop and the area for the sugarcane crop is prepared to a small extent only. In a year of drought the water does not suffice for the early paddy crop.

The area irrigated varies according to the capacity of a tank. The minimum area may be taken as 5 acres and the maximum I met with in this charge is about 337 acres in the case of the Gaddikeri Tank of Mugutkhan Hubli.

24 and 25. *Vide answers to Questions 23, 13 and 14.*

26. The irrigation is not supplemented by irrigation from wells.

27 and 28. The replies to these questions are the same as those given for Questions 16 and 17 above, except that the cultivator pays for the entire irrigable area.

29. The only private annual expenditure is the upkeep of the tank and its channels. Ordinary repairs, such as taking out silt from the waste water channel, conduit, etc., are done by the tenants, but repairs to dam, sluice, etc., are generally undertaken by the landlord or Government if extra assessment is charged.

30. Tanks which are not the private property of individuals are separately surveyed and shown as such in the village records. The procedure followed in case any repairs, etc., are found necessary is generally as follows: if a tank needs repair the rayats concerned petition to the Collector, who forwards it on to the Executive Engineer for consideration or disposal. Sometimes the Executive Engineer receives such petitions direct. But in any case the Collector is referred to with regard to the collection of the 10 per cent. contribution. If the contribution is received the Executive Engineer, who has already prepared his plan and estimate, submits his proposals to the Superintending Engineer for sanction or approval and the work is then executed. Now according to the present system of levying the 10 per cent. contribution from the rayats, it so happens that in most cases the contribution is not paid by the rayats in time owing to disagreements among themselves or to their inability, and the result is that grants for repairs often lapse. In other cases though the rayats pay their contribution promptly, yet want of necessary funds or provision in the budget delays the undertaking of the repairs, etc., by Government. In any case the rayats become the losers. I do not see why the rayats should be required to contribute towards the repairs, etc., of tanks when they are already sufficiently taxed in the shape of a consolidated assessment for using the water of a Government tank. The fair way would be to keep the management of such tanks entirely in the hands of Government and to incur whatever expenditure be necessary to keep them in proper order. My views appear to be in accord with those of the Tank Committee which sat in 1894, and which also prescribed roughly the amounts that would be necessary for the repairs of tanks in the Belgaum, Dharwar and Kanara Districts. According to the opinion of the Committee Rs. 1,40,000 was an adequate sum for expenditure on repairs of tanks in the Belgaum District, *vide*

Government Resolution No. 34—W.I.-419 of 5th March 1895 (Public Works Department)

According to the present system the rayats who are expected to take the initiative in the matter are always dilatory for want of unanimity or of means to pay the contribution, and so the repairs which Government undertake are not regular and systematic. There is no accurate record of the area irrigated from such tanks from time to time and of the turns or modes in which an individual cultivator should utilize the water. There is no record at hand of extra assessment recovered on account of each of such tanks. The consequence has been that many of the tanks have got silted up and on account of dispute among the cultivators proper repairs are not effected. An improvement in all these respects seems, in my opinion, necessary.

31. No tank of any considerable size has been constructed by any private person except by the Sir Desai of Shirsangi near Shirsangi. The tank is estimated to irrigate about 1,000 acres.

32. For the successful and good growth of paddy or other late crops in these fields it is essential to have these tanks in good repairs. The only fear is that if they be too near a village the weather is likely to become malarious by the growth of rank vegetation therein. The way to encourage their construction is to advance loans free of interest.

33. From the description of the tanks it may be seen that they are liable to get silted up each year. I have not ascertained the depth of each year's silt. Some of the tanks have become silted up during the course of 20 to 25 years. In one or two cases I have noticed that a silt of about five feet has been deposited during a decade. No dredging is resorted to; but when the tanks get dried up in the hot weather the silt is removed and thrown on the dam or used as manure or for bricks, etc., and the bed deepened. In a year of drought these tanks may be adequately deepened and famine relief provided.

E.—WELLS.

34. The talukas I write of may be apportioned into—

- (1) Mountainous tract—bounded on one side by the crest of the Sanhyadris and on the other by a north-south line drawn along the Khanapur-S. pa Road.
- (2) Hilly tract to the east of the above tract lying between the Khanapur-Supa Road and the north-east line passing through Deshnur, Parashwad and Mugutkhan-Hubli.
- (3) Undulatory tract to the east of tract No. 2 bounded in the east by a similar line drawn through Inchal, Bail-Hongal and Belavdi.
- (4) Sandstone hilly tract which interposes here and there and contains pebbles, laterite stones, etc. This soil is inferior and very porous.
- (5) Black soil plains underlaid with shingle, limestone or any other hard sub-strata.
- (6) Deep black soil plains.

The characteristics of the different tracts vary much. In tract No. 1 no irrigable land exists. In tract No. 2 tanks and the impounding of water of nallas are the means used. Wells can be sunk but only in low grounds which are in many cases rice fields. The soil below is treacherous; as soon as a spring is tapped it gives way. Consequently it is very difficult to build *pakka* wells in this tract. Tracts 3, 4 and 5 are suitable areas for irrigation. Wells are generally sunk along a nala or watercourse in low ground. The underground is of trap, limestone or soft muram. Water is fairly good and well adapted for irrigating the fields. Tract No. 6 cannot, except at a very heavy expenditure, be irrigated by wells.

The depth of a well varies also in different tracts. In tract No. 2 it is about 10 to 20 feet. In tracts Nos. 3 and 5 it ranges from 12 to 30. In tract No. 4 it is very uncertain; in some cases it is 10 feet, while in other places

it may be about 35 feet. In tract No. 6 the depth ranges from 40 to 120 feet. Mr. Artal

All the wells get their supply from springs, which in a year of drought fail or run short invariably. None of them are liable to become saline. 9 Jan. 02.

The cost also varies. In tract No. 2 it is about Rs. 400 while in tracts Nos. 3 and 5 it is about Rs. 200 for a *kachcha* well and Rs. 600 for a *pakka*. The poor agriculturist generally digs a pit in a hard ground and builds a masonry wall just sufficient to ply his *mot* safely. Such wells cost about Rs. 200. The same well, if built *pakka* on all sides, would cost about Rs. 600. For a large *pakka* well in medium soil the cost is about Rs. 3,000. The *kachcha* well lasts for about 12 years and a *pakka* well from 50 to 100 years. Water is invariably raised by means of a *mot* or leathern bag. The average area attached to a good well is about 2 acres and that actually irrigated about $1\frac{1}{2}$ acres. This area depends, however, on the kind of crop raised. The sugarcane crop cannot be irrigated more than half an acre by means of a single *mot*, while vegetable crops to the extent of two acres can be raised by the same means.

35. The lands under well-irrigation are generally of a medium quality. Irrigation enables a cultivator to raise crops twice instead of once or to raise such crop as sugarcane. In a year of ample rainfall the yield is nearly seven or eight times more than in the same kind of unirrigated land. In a year of scanty rainfall the yield is two or three times more than an unirrigated crop.

36. The yield, which of course is charged with expenses of cultivation, is worth about Rs. 200 if the crop is rich, while the value of the unirrigated crop on the same land is Rs. 20 or so per acre. In a year of drought it is about Rs. 75.

37. The cultivator generally pays in kind half a share in the produce of the land. If money is paid it is generally paid at about 50 to 75 per acre if the land be good. Government does not receive any extra rent beyond the survey assessment, which takes into account the adaptability of the soil to gardens. The Government rate varies from Rs. 1-12-0 to Rs. 3-8-0 per acre. These rates are paid on the irrigable area.

38. The selection of a site is generally made by local experts. I do not think that any Government aid would benefit the cultivators in this matter. In the construction of a well, however, some difficulties are encountered. The difficulties in my opinion are want of good boring or blasting tools and materials when the ground is hard, pumping out water, etc. No assistance has ever been offered by Government or by any local bodies in the shape of expert advice, trial borings, etc. In my opinion aid by expert advice, trial borings, etc., may be useful where (as in a great part of the Paragad Taluka) the rayats entertain little hopes of getting water by sinking a well. I think it would be advantageous if a fixed amount in the Provincial water grant is allotted annually for experiments in such tracts by means of trial borings by District Local Boards.

Another way is to keep in stock the improved appliances for sinking wells, and the cultivators should be encouraged to take a loan of these. At first special facilities should be offered to make use of these by keeping for hire at some selected convenient centres.

32. I am not in favour of constructing Government wells in private lands, because the cost will be more than when constructed by private individuals. The selection of site will not be made as easily as the cultivators do. The owner of the land may not accept the terms offered by Government. The maintenance charges will be heavy and there will not be a good return for the capital expended.

40. In some of the paddy fields, when water can be had at a depth of 5 or 6 feet, temporary rough wells are dug in ordinary years and by these means second crops are raised. Such lands are very few and are situated in tracts which are practically free from famine. Consequently they do not require any special encouragement.

1. Q. (The President)—You are District Deputy Collector of Belgaum?—Yes.

2. Q. How long have you held that position?—Since August 1898; before that I was stationed in Bijapur. I know the Bijapur and Dharwar districts well.

3. Q. In paragraph 2 of your memo. you give the proportions of the culturable areas under certain works. The total of 50,180 acres includes 6,899 under the head of "other sources." What other sources do you refer to?—*Patasthal* irrigation from the streams.

4. Q. It is a large area?—Yes, the advantage is that *Patasthal* irrigation can be carried on from streams without dams.

5. Q. You know something of the *bandhara* system in Nasik?—Yes. The system is very important there; we have nothing of that kind in this district.

6. Q. Is there any reason why there should not be?—The rivers are too deep; and therefore not suitable for *bandharas*.

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7. Q. You say that "an obstacle exists in alienated villages, in which the Inamdar rack-rents his tenants." Have the tenants no rights in these villages?—They have proprietary rights to hold the land; but they must pay taxes to the Inamdar.

8. Q. Can he raise it as much as he likes?—Yes.

9. Q. And is there no appeal?—No.

10. Q. You describe the case of an Inamdar who got a large sum of money from Government. Is he a large Inamdar?—Yes, Sir Desai of Shirsangi in the Parasgad Taluka has spent a large sum of money in building a tank. Besides the Rs. 75,000, lent by Government, he has spent another Rs. 75,000 out of his own pocket.

11. Q. Is it a very large tank?—One thousand acres will be commanded, and much sugarcane will be grown. Four Inam villages are commanded.

12. Q. Was it done as a famine relief work?—The tank was condemned by the Assistant Engineer, but the Inamdar completed it by famine labour and it has proved very useful.

13. Q. In paragraph 5 of your memorandum you say, "I am of opinion that special encouragement by grants-in-aid or otherwise may be given in case of large and speculative works such as large tanks, wind mills and the utilisation of the rivers or streams by means of machinery." Have you known of any application being made for takavi loans for works of that description.—For tanks and wells there have been applications, but not for works by machinery.

14. Q. Were any other applications for loans for tanks received besides the one you mention?—No.

15. Q. Have you had any applications for pumping up water?—Mr. Joyner had a scheme on the Malprabha river at Guréh-horúr, where pumping might have been done. [Mr. Beale explained that the scheme was rejected as an irrigation scheme. It had never been considered as a pumping scheme].—There is another project at Yergandi near the Gokak works.

16. Q. There are very few tanks in the district compared with other districts?—There are 400 tanks in Sampgaon, 500 in Khanapur, and some in Belgaum.

17. Q. Are they small tanks?—Yes, small rice tanks.

18. Q. Is there room for extension of tanks?—Yes.

19. Q. Are small tanks preferred?—Yes, in years of good rainfall the people irrigate cane from small tanks.

20. Q. Do they last all the year round?—They last till the middle of March.

21. Q. Is that enough for sugarcane?—Yes, sugarcane is sown in February.

22. Q. Early rain in April will keep up the sugarcane crop. If rain does not come, will not the crops suffer?—We generally get April rain. We water the crop once and then we depend on rain-water.

23. Q. (Mr. Ibbetson)—I noticed that in your printed memorandum you say, "the supply, therefore, is made to last till the end of May." Is that not a misprint for March?—Yes; with good rainfall it would last only till March.

24. Q. (The President)—Do the people here ever irrigate cane from wells, when the tanks are dry?—In the Chikodi Taluka, they grow cane with well water. The best sugarcane is that grown under wells. In 1887 there were 4,287 tanks, but there has been an increase of 50 per cent., and the number now is 6,327.

25. Q. (Mr. Muir-Mackenzie)—Is that for the Chikodi Taluka alone?—Yes.

26. Q. (The President)—Is there good rain in that taluka?—Yes. It is rocky and well suited for sinking wells.

27. Q. Is there the same necessity for irrigation in Athni?—The Athni, Gokak and Parasgad talukas are liable to famine.

28. Q. (Mr. Muir-Mackenzie)—I noticed that they grow a good deal of tobacco in Chikodi?—The Chikodi cultivators are Jains and they are very expert. The best tobacco is irrigated from wells. The ordinary tobacco depends on rainfall. The best *gul* is grown under wells; and the whole of this is exported.

29. Q. It must be a highly favoured taluka as regards rainfall?—The rainfall is not more than 25 inches. They have streams and the land is rich in water-bearing stratas.

30. Q. (Mr. Ibbetson)—When do they sow the tobacco?—In September.

31. Q. (The President)—Do you think there is room for a large extension of tanks throughout the district?—The sites are not suitable. In the Parasgad taluka it is very difficult to get water.

32. Q. Is that all black cotton soil?—Yes.

33. Q. Do the people not sink wells in black cotton soil?—No, because, if they got water, it is generally brackish.

34. Q. Is the soil deep?—The black soil in that district is from 5 to 10 feet deep in some places.

35. Q. (Mr. Ibbetson)—What is then underneath it?—White soil like ashes.

36. Q. (Mr. Muir-Mackenzie)—What the Public Works Department call *muram*.—Yes.

37. Q. (The President)—Is the Sampgaon taluka liable to famine?—No, it is not, but the soil is soft, and not suitable to irrigation.

38. Q. What can you do for the Athni Taluka?—I passed through it: it is very much like Jath.

39. Q. What can you do for Jath?—Wells could be made there.

40. Q. Could you have tanks?—I do not think so.

41. Q. I understand that Athni is the worst taluka in the Presidency? What can be done for it?—Irrigation from the Krishna is not possible in Athni.

42. Q. What is the reason. Is it too low?—Yes.

43. Q. The Taosi tank was given up. Do you think the tank would have been useful?—Yes. If it had been successful, it would have protected a large area.

44. Q. Is irrigation possible from the Dori river?—No.

45. Q. Do you think then that wells should be encouraged more than they are?—Yes, wells could be constructed in Saundatti in the Parasgad Taluka. I know the case of a man, who has five acres of land, who has built a well there. The assessment is very low, Rs. 8. Formerly he used to grow *juari*, but he converted into garden crop and was able to let the land for Rs. 100.

46. Q. (Mr. Muir-Mackenzie)—What is the cost of such a well?—Rs. 1,000. That particular man has applied for Rs. 1,000 to complete his well, and I sanctioned him a takavi loan yesterday.

47. Q. (The President)—You must have a great number of applications for takavi. Yes, in a great number of cases they really want money for subsistence.

48. Q. How long does it take a man to get a reply to his application?—It depends, it may be 15 days or one month. I think some other system, lending money, should be devised, such as Agricultural Banks, which should replace the takavi system.

49. Q. Yes, but do you think the Banks will be able to recover?—The Banks should be given power to recover in some summary way. I know that Sir Desai of Shir Sangi and Wantimori has lent as much as Rs. 50,000 to the rayats at the rate of 8 annas.

50. Q. (Mr. Muir-Mackenzie)—I suppose they have lent it to solvent men?—Yes, they have taken great care about that.

51. Q. (The President)—You say in paragraph 6, "I do not think that any remission has been granted or claimed by the rayats. The case of the Gaddikeri at Mugul-Khan, Hubli, may be mentioned as an example. The District Local Boards have not done any irrigation work. The Local Boards, as at present constituted, will not, I think, be able to undertake these works. I am of opinion that the Protective value will be greatly increased, if more money and greater attention to their up-keep be paid than at present, and a few rules be made for this purpose." In whose hands should the Government place them. In the hands of the Revenue officers?—I think the Public Works Department could look after them better than the Revenue officers, who are overworked.

52. Q. Could the Public Works Department give their attention to small tanks of five or six acres?—Yes.

53. Q. There is no science required to repair such tanks. Would it not be better to let the people look after them themselves?—Formerly the custom was to put three or four tanks in charge of each village and the villagers used to clear the channels, and look after the tanks. But now that the one-anna cess is levied, they will not do so.

54. Q. Would it not be better to reduce the assessment, and let them do it?—I do not think so. They would let the

tanks go to ruin. They would quarrel among themselves. It is better for Government to do the repairs, and raise the usual assessment.

55. Q. Do you not think it will give a deal of trouble to Government to repair a large number of small tanks?—I suppose there are only 30 or 40 tanks.

56. Q. (Mr. Ibbetson).—If the villagers did the repairs before, why did they not do them now?—The people are better informed now.

The President read the following extract from a paper submitted by witness on the subject of silting up of tanks.

“(1) *Baswannas Tank behind the Dharamsalla of Sampgaon.*

The area of the tank is 16 acres and 33 guntas and the area irrigated 17 acres and 38 guntas. In years of ample rainfall, the tank has water up to February and rayats make use of it once in August, if rain be not sufficient and once at the beginning of October when the paddy crops come to ears. No repairs appear to have been done to this tank by Government. It is in a most dilapidated state. Water stands only in one-third or so of its area. The rayats spend money only on removing silt from the low portion of the tank near the sluice. These repairs they do at the cost of 8 or 9 *kudos* of *juari* after an interval of eight or ten years. The tank does not appear in the list of irrigation tanks.

(2) *Angdevarkari—*

(a) Sampgaon, No. 1, has an area of 4 acres 16 gunthas.

(b) Gullavankeri, No. 2, has an area of 11 acres and 38 gunthas.

No. 2 irrigates 17 acres, and No. 1 irrigates 38 acres or they irrigate 55 acres and 16 gunthas.

The area, viz., 55 acres and 16 gunthas can be irrigated in years of ample rainfall. Besides, after taking out paddy, sugarcane may be cultivated in about 25 or 30 acres of land nearer the tanks. In the rest of the irrigable area, *auri* is sown.

When petty repairs, such as repairs to the sluice or dams are necessary, rayats concerned contribute for it. The expenditure incurred is about Rs. 12 in a year or every alternate year. The tank in survey No. 124, viz., Gullavankeri was, it is said, repaired by Government in 1892. The rayats are said to have contributed Rs. 100. The dam is in disrepair. There is no *pukka* built sluice. The tank is silted up, and about one-third of it only retains water; and the result is that, out of the whole area, acres 583—7 gunthas under the tank only acres 55 and gunthas 16 is irrigated. The tanks are estimated to require about Rs. 1,500 to Rs. 2,000 for their repairs.

(3) *Halladkeri Tank at Karambal, Taluka Khanapur.*

The tank area is 3 acres, 17 gunthas, and the assessment is *nil*. There is no record to show when the tank was constructed, nor is there any record as to when it was repaired; but it appears from what the village officers state, that it was once repaired before the head-quarter station was transferred from Bidi to Khanapur, which took place in 1864. This tank was again repaired by the Public Works Department in 1899 at a cost of Rs. 2,280 one-tenth of which, viz., Rs. 228 was contributed by the rayats of the village.

(4) *Maharki Tank of Kupatgiri.*

The tank area is 1 acre and 18 guntas of land, if repaired. Now the tank is almost filled with sand and can hardly irrigate 10 acres, if rains are good. The tank was repaired by the rayats some 20 years ago at the cost of Rs. 500, and was deepened. But in three or four years it was covered with sand. It could, when repaired, hold water 3 or 4 cubits, 18 inches high. It cannot now hold half as much. About 40 acres of land under the tank is used for paddy sowing. But it gets no water-supply from the tank, and consequently the produce is considerably less.

If the tank is repaired, the same land may be fit to grow sugarcane. All this land is assessed highly owing to the proximity of the tank, which practically is of no use now to the rayats.”

57. Q. (Mr. Higham).—You say that a great deal of land is thrown out of irrigation by the silting up of these tanks?—Yes.

58. Q. The land has been assessed at wet rates, and cannot get irrigation?—Yes; the people would have grown sugarcane, if they could have got the water; but now they only grow paddy.

59. Q. (The President).—Because the tanks are not cleared out?—Yes.

60. Q. (Mr. Higham).—Can you tell me roughly what the cost, per 1,000 cubic feet, would be?—I cannot tell the cost of 1,000 cubic feet; but it will cost Rs. 1,000 to Rs. 2,000 for the removal of the silt from a small tank.

61. Q. How many thousand cubic feet could you remove for that sum.—I cannot tell—perhaps a depth of two to five feet.

62. Q. (Mr. Ibbetson).—How many acres would such a tank irrigate?—About 5 to 10 acres.

63. Q. (Mr. Higham).—Can you tell me the cost per 1,000 cubic feet of clearance, if the work were given out by contract?—I cannot.

64. Q. It seems to me that it would cost more to clear one thousand cubic feet of silt than the irrigation it would give would be worth?—Yes.

65. Q. Have you any cases in which tanks have been cleared out in this way?—No.

66. Q. I presume that the only remedy would be to raise the banks?—That will be more economical.

67. Q. You say that the Maharkhi at Kupatgiri would irrigate about 60 acres?—Yes; but it is silted up so much that it can only irrigate 10 acres. The cultivators spent Rs. 500 on it, and now it is able to irrigate 40 acres.

68. Q. If they spent Rs. 1,000 on it, would it irrigate 80 acres?—I do not know.

69. Q. In the Khanapur taluka the Public Works Department built a dam across the stream at a cost of Rs. 2,280; and, I believe, that is since silted up. It damaged another village?—It silted up on account of the sand, and the villagers have now objected to it, as it spoils their land.

(Mr. Muir-Mackenzie stated that 23 lakhs will probably be spent by Government in the Belgaum, Dharwar, Kanara and Bijapur Districts on the systematic repair of tanks, in order to save loss of revenue.)

70. Q. I want your opinion on this. Granting that so much money is put at your disposal, for the repairs of tanks, would it be worth deepening the tank to provide extra storage?—It will be more economical to raise the banks, but the general belief is that water evaporates and runs dry sooner in tanks where the silt is not removed than where it is removed and consequently the tank deepened.

71. Q. Does any land owner ever deepen his tank?—Yes, in a clumsy way.

72. Q. I make out that it would cost Rs. 5,000 for every extra acre brought under irrigation, I want to know what you think about it?—I cannot say anything definitely about it, but it would be much better to raise the embankment.

73. Q. Is deepening ever done?—Yes; one man's tanks are sometimes deepened.

74. Q. You say black cotton soil in this district is not suitable for irrigation, what do they cultivate on that soil?—Some sowcars in Dharwar and Nalgund tried to irrigate deep black cotton soil; but they failed to grow garden crops. People grow wheat cotton and *juari* in ordinary black cotton soil.

75. Q. You have black cotton soil, which is not very deep?—In the Dou Valley the black cotton soil is said to be 20 feet deep.

76. Q. Is there any black cotton soil, which cannot be irrigated?—The black cotton soil in the Paragad taluka cannot be irrigated.

77. Q. (Mr. Ibbetson).—Are you speaking of the whole district or of your taluka only?—Only of my charge.

78. Q. (Mr. Higham).—With regard to the tank built by the Sir Desai of Shirshangi, has that been completed?—It is not finished. The stone work has to be done.

79. Q. Has water been let into it?—The tank is full of water. But the water has not been used, and no canals have been made. It silts up, as it is situated in a very sandy place.

80. Q. Does it silt fast?—I think it will silt up in 25 years.

81. Q. Has he spent more than the Rs. 75,000 advanced by Government, besides the Rs. 75,000?—He has spent Rs. 20,000 to 25,000 out of his own pocket.

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82. Q. You do not think that he will make any profit out of it?—It will irrigate 1,000 acres, and, if he gets Rs. 10 an acre, that will amount to Rs. 10,000. The land under the tank is *kural* land.

83. Q. You say that there are a lot of places where the rayats make earthen dams across nullahs which cost Rs. 10 to 15 every year? Would it be worth Governments while to help them to make *bandharas*?—Yes, such as are made in the Nasik District.

84. Q. Are any sites available?—Yes, there are some small streams, suitable for *bandharas*.

85. Q.—What about the rivers?—In Chikodi they have *patasthal* cultivation.

86. Q.—How high above the bed do they have the dams?—Five or six feet.

87. Q. I suppose they run dry in the cold weather?—They last to the end of February or March.

88. Q. How many works of this kind are there?—Not many.

89. Q. You say there are not many *bandharas*. Have you no idea how many there are?—I have seen a few in Chikodi and Sampgaon.

90. Q. In your memorandum you refer to "other sources." You say 6,000 acres are irrigated by other sources?—Those other sources might be *bandharas*.

91. Q. I suppose sugarcane is irrigated sometimes from these *kachcha* bandhs?—I have seen sugarcane watered by *supas*.

92. Q. (Mr. Ibbetson.)—You told us that where the survey system was introduced it protected the rayats against rack-renting in Inam villages, as the people were at the mercy of the Inamdar. Has the survey system been introduced into many villages?—The survey system has been introduced lately in the Chikodi talukas in six or seven out of 90 Inam villages.

93. Q. It has not yet been introduced into half the number of villages?—No.

94. Q. It was done at the request of the Inamdars?—Yes.

Mr. Muir-Mackenzie.—I think the total number of alienated villages was 58; and a survey has lately been introduced into most of them.

95. Q. (Mr. Ibbetson.)—Has it been introduced into half?—I am not certain about the number.

96. Q. Have you any idea what the proportion is of the Inam villages in your charge in which the Survey Rules have not been introduced?—There is one village in the Sampgaon taluka. I cannot give the figures for the other talukas.

97. Q. You told us that the rayats sowed sugarcane in February, and trusted to early rains in April to water it. Would the cultivators sow sugarcane on the chance of rain coming at that time?—Sugarcane is sown in the rice areas on the chance of the water lasting. A hole is dug in the rice field, and the water is raised by *supas*.

98. Q. Broadly speaking what part of the district is most liable to famine?—The whole of Athui, some part of Gokak, Paragad and ten or twelve villages on the north-east of Chikodi taluka.

99. Q. Has there ever been a famine in the remainder of the district?—Not so far as I know.

100. Q. Was there a famine in 1896 and 1897?—There was no famine in 1896, in Sampgaon there was a twelve-anna crop.

101. Q. There was a famine in 1876?—Yes.

102. Q. And the scarcity in 1891?—Yes.

103. Q. There was famine in 1899, and again last year also?—Yes.

104. Q. Where are the rice tanks principally situated?—The rice tanks are in the secure parts, and not in the famine parts.

105. Q. Are there any tanks in the insecure parts?—No.

106. Q. And wells?—The whole number of the wells are in the secure parts.

107. Q. You told us that in many parts of the district, the extension of wells is not possible because you cannot get water. Where are those parts?—In the insecure tracts. They are in the southern portion, where there is black cotton soil, and well irrigation is not possible.

108. Q. Well irrigation is not possible on any very large scale in the southern portion of the insecure tract?—No.

109. Q. Is there any part of the northern portion in which wells can be sunk?—About the northern parts I cannot say.

110. Q. You told us that it took from two to four months to get a reply to an application for a takavi loan. You speak, I suppose, of famine times.—How long does it take in ordinary times?—In ordinary times it takes from four to six months.

111. Q. What was the simplification of procedure adopted in the times of famines?—We kept an extra establishment, which made summary enquiries.

112. Q. Do you think Government will lose much by the summary procedure adopted during the famine?—Yes, in Bijapur, I am afraid that in many instances Government will not be able to recover the advances.

113. Q. You do not think it would be safe to adopt a summary enquiry in ordinary years?—No.

114. Q. With regard to the people keeping their own tanks in order, do you suppose that, if Government were to remit all the revenue of such tanks, as it does not intend to keep up, and handed them over to the rayats, would they keep them in repair?—No, they would not turn out to clear them.

115. Q. And yet you tell us that, once upon a time, they used to turn out?—Yes, and they would do it now for old and respected village officers.

116. Q. Suppose we legislate to give civil officers power to call upon the people to turn out. Would that be a good thing?—Yes.

117. Q. If you had that power, do you think it would be necessary to use it. Knowing you had the power, would it not induce the people to turn out, without undue pressure?—Yes, in places where the cultivators are intelligent.

118. Q. I understand that rice is grown, without irrigation, except in a very dry year?—Yes.

119. Q. Is that entirely in the secure tract?—Yes.

120. Q. You told us about small earthen dams that the people throw across the nullahs, for which you think Government should give takavi. The earthen dams are washed away in the monsoon and so long as you have earthen dams they will be carried away year by year, and there will be no silting up; but if you build *bandharas* there will be silting up?—When they build *bandharas* the people usually have one or two sluices.

121. Q. You said that the wells ran dry in Dovi, that is, the tract in which there was no famine before?—Yes.

122. Q. Taking the cultivated area of the district what is the proportion of black soil which can be irrigated. Is it one-fourth?—Yes, about one-fourth.

123. Q. Is that in the southern tract?—It is in the pure black soil country in the southern portion of the insecure tract.

124. Q. Suppose a rayat borrows money from the *bani* what interest does he pay?—He pays 12 per cent.

125. Q. Does he generally get that rate?—The rate varies and may be as much as from 18 per cent. to 24 per cent.

126. Q. Then is the 5 per cent., charged by Government, any obstacle?—I do not think so.

127. Q. Suppose we reduce it to 3 per cent.?—It would be a special encouragement.

128. Q. Although wells cannot be made in the insecure tracts?—Some small ones can be made.

129. Q. Why cannot wells be made in the northern portion of the district?—There is no subsoil water. The people there sometimes have no water even to drink. They have to fetch water for drinking purposes from four or five miles.

130. Q. What is the ordinary period for the repayment of takavi loans?—About ten years.

131. Q. Do you think that is enough?—Yes.

132. Q. Are there any complaints as to the shortness of time?—No.

133. Q. So far so I can make out, about 6,000 acres are irrigated by small earthen dams. Does Government charge anything?—Nothing so far as I know.

134. Q. What is the *patasthal* rate?—The rate is levied for eight or nine months and is included in the land revenue. I think it is about Rs. 2 an acre.

135. Q. Is it levied each year for all the lands actually irrigated?—Yes, it does not vary from year to year.

(Mr. Muir-Mackenzie explained that when a new *bandhara* is made it is inspected and the area which it can irrigate is marked down, it is the same in regard to a *kachcha* or *pakka bandhara* and the assessment does not vary every year.)

136. Q. You say that a man cannot build a *kachcha bandhara* without permission?—In 1899 I suggested that a general permission should be given.

137. Q. How long does it take to get permission?—About 2 months. I thought a good deal of time was lost and so in the famine I issued a circular letter giving permission to use water from the streams without charge.

138. Q. Has a man to make an application every year?—No, only once.

139. Q. At present you have 6,000 acres irrigated from these little streams, suppose Government were to remit the *patasthal* rate and let the rayat use water without having to ask permission, would the area be largely increased, do you think?—Yes.

140. Q. Would it be doubled?—It might possibly be doubled.

141. Q. Is any of that irrigation in the insecure parts?—No, it would all be in the secure part.

142. Q. In regard to small tanks are the *bandhs* generally in good repair?—No, they are being destroyed by neglect.

143. Q. How long has this been going on?—They have not been repaired in my generation.

144. Q. How much of the area irrigated has been reduced in consequence?—Perhaps half the original area.

145. Q. Mostly rice tanks, I suppose?—Yes.

146. Q. Are there many private tanks?—These are called one-man tanks.

147. Q. Do people still make these tanks?—No, not now.

148. Q. Why not, it is not, I suppose, because they are very expensive?—No, they cost Rs. 200.

149. Q. How many acres do they irrigate?—About 4 or 5 acres.

150. Q. Of cane?—They would irrigate 1 or 2 acres of sugarcane.

151. Q. Have you had any applications for *takavi* for this kind of tanks?—No.

152. Q. Why?—Because this area is not subject to famine.

153. Q. Take a rice field under a tank and a rice field dependent on rainfall, what is the difference in the crop?—The irrigated crop would be double that produced by the early rainfall.

154. Q. Is that because the rain falls or that a better crop is produced?—I might give an instance. At Haldalberi the rayats got a double crop because they irrigated their rice fields from the tank.

155. Q. What do you mean by a *kachcha* well; one without any masonry at all?—Yes.

156. Q. Such a well might last 12 years?—Yes, about 12 years.

157. Q. If it is built up on the *mot* side, how long will it last?—Thirty or forty years. They have such wells in the Chikodi Taluka.

158. Q. Are they showing signs of failing. Is there any reason why they should not go on for another 30 or 40 years?—I do not see why they should not.

159. Q. Were many wells made during the famine?—Yes, some new wells were made in the secure tracts and some were deepened.

160. Q. Are many of the new wells still left *kachcha*?—Yes, for want of funds.

161. Q. Suppose Government gave *takavi*, would they complete them?—They have no security to offer.

162. Q. When a man builds a *kachcha* well and finds water, does not the land become more valuable as security?—Yes, but it may be already mortgaged.

163. Q. Does not the Government claim take precedence?—The new rule is that Government has no precedence over other mortgages.

(Mr. Muir-Mackenzie explained that the rule referred to mortgages in possession, and the question was

under consideration in view of the heavy advances then being given.)

164. Q. (Mr. Rajaratna Mdlr.)—You just said that half the area of the tanks has gone out of irrigation. What is the probable loss of revenue in consequence?—No loss as the people pay the same revenue.

165. Q. Suppose the total area of a tank is 1,000 acres and it goes down to 500 acres, what would be the loss of revenue?—None so far as I know.

166. Q. Suppose the land is transferred to dry?—The water share would be about one fourth of the revenue. The loss would be one-fourth.

167. Q. (Mr. Muir-Mackenzie.)—The water share is 80 per cent. of the revenue under these tanks?—On the Maharki tank 40 acres have been reduced to 10, whereas the rayats are still paying full wet assessment though 30 acres have gone out of irrigation.

168. Q. What authority have you for that statement?—I was there yesterday and I noticed that very little sugarcane was being grown, I enquired and got this information from the village officers and rayats.

169. Q. Was it last year only or is it a permanent reduction?—It is a permanent reduction.

170. Q. I think that will require very careful investigation?—The land was assessed for rice and not for sugarcane.

171. Q. (Mr. Rajaratna Mdlr.)—In the case of petty tanks, suppose a Sub-Overseer is allowed for each taluka and a sufficient allotment is placed with the Mamlatdar, could not the repairs be arranged for?—We have a Sub-Overseer in Kanapur, but the difficulty is the rayats refuse to pay the 10 per cent. contribution.

172. Q. Supposing the 10 per cent. contribution was abolished?—Then the tanks would be repaired more quickly.

173. Q. Would you place any limit on the tanks you propose to transfer to the Revenue Department?—I should say that tanks irrigating 5 acres and less should be transferred.

174. Q. Would you go beyond that limit?—That question was considered by a Tank Committee in 1894, and they came to the conclusion that Revenue Officers would not be able to look after larger tanks.

175. Q. Would you not go so far as a 50-acre limit?—No, that is too large a tank—say 10 acres.

176. Q. You say that rice is grown in many parts with the aid of rainfall. Are such lands classed as wet?—Rice is grown by rainfall only in some areas which are classed as *Tari* dry lands.

177. Q. In Kanapur there is a large area under rice cultivation, does it depend on rainfall?—Yes.

178. Q. It is stated that forest officers do not allow the rayats to take leaves for green manure?—Rice lands are not manured with green leaves. These rayats have a good supply of manure from their cattle.

179. Q. They have more cattle than the rayats in the red soil districts?—Yes.

180. Q. Do you know the Muchkundi tank?—I have seen it, but I know nothing about it.

181. Q. Do you know the reason of its failure to irrigate the large area under it?—A suitable area is not under command of the tank. Some land at Bagalkot is irrigated by the tank.

182. Q. You stated that the Sir Desai of Shirangi was given a loan of Rs. 75,000. How was the money paid?—In instalments of Rs. 25,000.

183. Q. How long has the tank been under construction?—Since 1897.

184. Q. Is the recovery to be made at once?—No, about two years after.

185. Q. Do you recover interest from date of payment of instalments?—It is recovered in instalments, but it is calculated from a date to be fixed in this behalf by the authority who sanctions the loans, which is generally after not more than six months from the date of payment of the loan.

186. Q. Have any instalments been recovered?—Yes.

187. Q. What guarantee have you that the whole of the money has been properly spent; has any special inspection been made?—He kept an account. He is a respectable man and I accepted his statement. When I asked for an inspection of his account he handed it to me at once, and

- Mr. Artal.* I found that he had actually spent Rs. 92,000 on the tank. He employed an Overseer on Rs. 30 per month.
- 9 Jan. 02. 188. *Q.* In paragraph 22 of your printed memorandum you say:—"that in years of drought * * * the Collector should issue general orders permitting the free use of such water"; what do you mean? Is it always necessary to go to the Collector or Assistant Collector for permission?—The village officer does not allow the use of water from streams without the permission of the Collector.
189. *Q.* Has the Mamlatdar or the Sub-Divisional Officer no power to sanction it?—No.
190. *Q.* In paragraph 4 you say:—"The Land Revenue Code adequately protects against any future enhancement of revenue having regard to improvements effected in any land during the currency of any previous settlements at the cost of the occupant or the holder." Are not the rayats protected against enhancement in future revisions of the settlement?—They are protected against future enhancement if they build their own wells.
191. *Q.* (*Mr. Ibbetson.*)—Do the people know this?—Most people do. Only the ignorant *Kunbis* may not know it.
192. *Q.* (*Mr. Muir-Mackenzie.*)—Can you explain the general ignorance of Teshildars and Mamlatdars regarding exemption on improvements?—No, except that perhaps they do not study the Land Revenue Code.
193. *Q.* You are familiar with *tals*. You directed my attention to them in 1896-97 in the Taluk of Indi?—At Horti, I remember telling you about them.
194. *Q.* I want to know whether you consider these bandhs are advantageous in famine years in affording the rayat to grow some crop?—If there is no rainfall they are useless.
195. *Q.* But does not the soil behind these bandhs retain moisture?—Yes, that small area will be protected in a famine year.

WITNESS No. 76.—*MR. P. J. FITZGIBBON*, A.M.I.C.E., Executive Engineer, Belgaum.

- Mr. P. J. Fitzgibbon.* 1. *Q.* (*The President.*)—You are Executive Engineer of this District?—Yes.
- 9 Jan. 02. 2. *Q.* How long have you been here?—For four years.
3. *Q.* I understand that you were here during the famine?—I was here during the famine of 1896-97; I was not here during the recent famine.
4. *Q.* In what other districts have you served?—In most of the Deccan Districts, in Gujarat and in the Konkan.
5. *Q.* Other witnesses have informed us that Athni, Gokak and the Paragad talukas have suffered most from famine, especially Athni?—Practically they were the only talukas which suffered.
6. *Q.* Athni was especially bad?—Yes, in Athni the people suffered very severely.
7. *Q.* Can you tell us what means, you think, should be adopted to enable these talukas to resist future famines. I would like you to take the talukas one by one. Take Athni first; have you any promising tank schemes in view in that taluka?—In Athni I have a tank scheme on view. It is a very promising scheme, and I am having it surveyed. It is near Kokatnur, and is at the junction of the two nallahs, its catchment area is 185 square miles, it will command a fair tract of land and will be as big as the Visapur tank at Ahmednagar.
8. *Q.* Is it a good site?—The tank has just been surveyed. I have not yet had the canal surveyed, but I have no doubt that it will command as much land as there will be water for.
9. *Q.* Is it one of the tanks mentioned in Mr. Baale's report on Irrigation works in the Bombay Presidency?—Yes, it is referred to on page 319 of the report.
10. *Q.* Has it been thoroughly examined yet?—I am having it surveyed now.
11. *Q.* And what do you propose to do for the rest of Athni?—I do not think there is anything else to recommend.
12. *Q.* Can you tell us something about the Taosi tank. I believe 2 lakhs of rupees have been spent on it. Is it a hopeless project?—Yes, quite hopeless, it was not thoroughly examined before it was started.
13. *Q.* That was a fatal flaw?—Yes, there was an absence of foundations. We could not found the puddle trenches at 35 feet depth. We got to sand pockets and the filling in slipped away as it would in quicksand.
14. *Q.* How deep down did you get?—About 30 or 35 feet.
15. *Q.* Were any trial borings taken to try and find rock?—No, we dug down to 35 feet and went no further.
16. *Q.* Considering the great wants of the District supposing you were likely to find rock at 40 feet, was it worth while going down?—No.
17. *Q.* (*Mr. Higham.*)—Would you build a high dam there?—No, it is *karal* soil which is not suitable for a high dam.
18. *Q.* (*The President.*)—What about a masonry dam?—You would not get foundations, and if you got them at 40 feet, the dam would be very expensive.
19. *Q.* The only reason I mention it is that apparently as regards situation it is a very desirable project?—Yes, so much so that I surveyed the canal for 90 miles to the boundary of the district where it joined the Krishna.
20. *Q.* What was the storage to be?—I cannot quite remember, but it was a large tank with a dam $\frac{3}{4}$ of a mile long.
21. *Q.* Are you quite sure it is not worth going on with?—Yes, on that particular site there can be nothing but failure.
22. *Q.* Are there any other possible sites?—At Sirur higher up where there was a site, the soil was worse still.
23. *Q.* I suppose you do not know of anything else that can be done for Athni taluka?—I know of nothing else in that part of the district in the way of large irrigation works. We might do a good deal in the way of constructing puddle trenches across the larger nallahs to hold up the sub-soil water. In 1896-97 there was a good supply of sub-soil water in the district, but last year there was nothing. The wells had to be deepened and the people were very badly off for water.
24. *Q.* (*Mr. Higham.*)—Where do you propose to put these puddle trenches?—At Visapur where the people were very badly off for water during the first famine year, I made a puddle trench across the nallah bed and in the second year of famine the people had a splendid supply of sub-soil water upstream of the trenches. I then put down Norton tubes in the river bed and the wells in the upstream side got an increased supply.
196. *Q.* Do you consider that owing to the great advantage of these *tals* their numbers have increased?—Yes, about 10 per cent.
197. *Q.* How do they build them?—They borrow *takavi*. They spend some of the money for their own use, and a whole family, men, women and children work on the *tal*.
198. *Q.* Do they make them of earth or stone?—Usually of earth.
199. *Q.* I have seen stone ones?—Yes, I know of a case in which a man has spent Rs. 1,000 and made a *tal* of stone with sluice gates. It is like a reservoir.
200. *Q.* The greater number are not like reservoirs, they are intended only for a slight accommodation of water?—Yes.
201. *Q.* Is not the scope for constructing those *tals* limited by the small size of the holdings in many cases?—Yes, if a man wants to build a *tal* he would have to go through another man's bed in some places.
202. *Q.* The water spread must be in his own holding?—Yes.
203. *Q.* Why do people not build more *tals*, is it want of money?—Yes.
204. *Q.* Then it would be a good object for Government to give liberal *takavi* for?—Yes.
205. *Q.* In 1896-97 what was the extent of advances for this purpose as compared with wells?—For wells one-fourth; for *tals*, etc., three-fourth; half of this was for arms and the remaining half for deepening, etc.
206. *Q.* (*Mr. Ibbetson.*)—Did I understand you to say that where cultivators took *takavi* for *tals* they employed their own labour, and that for purposes of building *tals* in ordinary years *takavi* is not necessary. Then it is really necessary as famine relief?—Yes.

25. Q. What about the Gokak Taluka?—I think that the extension of the Gokak canal should be sanctioned.

26. Q. Will you please tell us all about the Gokak canal, two of our members were not there yesterday when you took us over the works. What is the storage?—In the Gokak reservoir as at present constructed 900 million cubic feet is stored.

27. Q. You propose to have two subsidiary reservoirs in addition to raising the weir 7 feet. What would your storage be?—The raising by 7 feet would double the present storage to 1,800 million cubic feet.

28. Q. Your two new subsidiary reservoirs would come above?—Yes, there will be two reservoirs and there would be a dam to each.

29. Q. What would they store?—The storage will be as follows:—At Hadalgi 3,000 million cubic feet; at Aral-gundi 4,300 million cubic feet and at Beniwad 3,122 (the latter is an alternative scheme is Aral-gundi), altogether about 10,000 million cubic feet.

30. Q. This 10,100 millions of cubic feet besides the present reservoir supply of 900 million or after the present dam is raised, say altogether something short of 12,000 cubic feet?—Yes.

31. Q. What will be the full demands from the mills?—The mills require 136 cubic feet per second, and this for seven months amounts to 2,500 million cubic feet of the storage.

32. Q. That will leave 8,500 million cubic feet, nearly the whole of which can be claimed for additional irrigation?—Yes, except what is lost by evaporation and percolation.

33. Q. On the other hand, I suppose there is a good deal of water entering the reservoir up to a considerably late date after the monsoon?—Yes, we get the benefit of the streams. About 93 cubic feet of water per second is now running into the Dhupdal or Gokak reservoir, but we get nothing after March.

34. Q. That is a large ingredient to consider in connection with the storage of your reservoir?—Yes.

35. Q. I suppose in an ordinary monsoon season you would expect the reservoir to fill by the end of the monsoon?—Yes, we have never drawn on the reservoir even in the worst years before the beginning of December.

36. Q. How far down does your irrigation go?—The main canal is $2\frac{1}{2}$ miles, and there are 12 miles of branch canal.

37. Q. What is the maximum area irrigated by the Gokak canal?—The irrigation on the Gokak has been a little over 10,000 acres out of a commanded area of 17,000—more than 60 per cent.

38. Q. A very high percentage indeed?—The branch canal from which we irrigate runs along a ridge and we can irrigate the land on both sides.

39. Q. Was the proposed second section ever begun at all?—Yes, several lakhs were expended on earthwork during the famine of 1876-77. It is proposed that Section II should be 58 miles long with a branch section of 40 miles in the Mudhol State, a branch in the Jamkhandi State of 40 miles and an extension of 40 miles beyond Mudhol to command the area in British territory in the Bijapur District.

40. Q. What is the soil all through that tract?—There is a good deal of poor soil. But near the rivers Ghatprabha and Krishna, the soil is black, while it is red on the ridges.

41. Q. Is it deep black cotton soil such as would decline irrigation?—In a year of good rainfall that black soil might refuse water.

42. Q. You have no fear yourself of the water not being taken for irrigation?—I think that they would take it largely in the *khari* season for all light lands, and in a bad year for black soil as well.

43. Q. Does your scheme embrace a tail reservoir that the waste water might be turned into?—We have a scheme, but the conditions are unfavourable, it would submerge lands worth two lakhs of rupees.

44. Q. Do you know whether there are any sites in Bijapur?—I think they have been examined very largely. The difficulty is that banks of the rivers are very high and the channels very low.

45. Q. You think the whole country can be commanded with reservoirs and the storage tanks proposed in the ghats in connection with the Gokak extension project?—Yes, practically.

46. Q. Why can't you go beyond Bagalkot with the canal?—With the proposed reservoirs there will not be enough water for the whole of the land. The canal besides cannot go beyond the Ghatprabha in Bijapur where it joins the Krishna near Bagalkot.

47. Q. (The President.)—We hope that the people will show a better appreciation for the water at Bagalkot than the people do on the Muchkundi. Is that not due to the fact that the tank does not always fill?—Yes, the people object to an uncertain supply.

48. Q. The rough estimate, I understand, for the Gokak extension is 91 lakhs of rupees?—Yes, for the whole project.

49. Q. How many years will it take to complete, supposing you had the money as fast as you can spend it to advantage?—I think it would take 15 years.

50. Q. You base that on the labour available?—Yes.

51. Q. But will not big works attract labourers from other districts?—Yes, but even then it will take 15 years to complete.

52. Q. Are the sites of the proposed storage tanks near the Dhupdal tank which we saw yesterday?—Yes, Beniwad is within 10 miles, the second within 20 and the third within 30 miles from the Gokak weir.

53. Q. All three are in the Belgaum district?—They are within the limits of the district, but the Hadalgi submerges land entirely in the Kolabpur State and the Aral-gundi partly.

54. Q. Would that be an insuperable difficulty?—No, I think it is only a question of compensation.

55. Q. Now to go further south, what about the Parasgad taluka?—Before leaving the Gokak district I should like to mention the project to make a tank on the Markandya. I should like to see a reservoir constructed in the Markandya river. It runs through a gorge which could be closed by a masonry weir and would command a considerable area of land. It joins the Ghatprabha just below the falls.

56. Q. Is there any means of utilizing the waste water of the mills?—The waste water from the mills at Gokak cannot be utilized; the river is sluggish and lies too low. There is a scheme in connection with the Chiknandi *nallah*. This scheme was mooted 25 years ago. A bridge has since been built close to the site and there would be some expense in consequence, as the bridge would have to be shifted and the road re-aligned. I am also doubtful about the foundations. The Markandya project would command part of the same area.

57. Q. The Markandya would take up irrigation on the right and the Gokak extension on the left bank?—Yes.

58. Q. How far east does that Taluka go?—There are Native State villages which it touches.

59. Q. Have you had any consultation with the Executive Engineer, Bijapur, about these projects?—No, the Executive Engineer, Bijapur, has not yet been consulted as to the Gokak extension project.

60. Q. In what time could you have the project ready for submission to Government?—I cannot promise it in any time, I have no leisure.

61. Q. If the Government gave you an Assistant Engineer and a survey establishment how long would it take?—With an Assistant Engineer and a survey party a good deal could be done in six months. Of course no surveys would be possible in the rains.

62. Q. A year hence, would the project be ready?—Yes, a capable Assistant Engineer could work it out in detail in a year.

63. Q. I suppose you look upon this as the most promising scheme in the district?—Yes, the only other large scheme is the Malprabha project. The river passes through a gorge, and the idea is to build a high masonry dam, but this would submerge a tremendous area of land. It is near Manoli (Navaltirth).

64. Q. You have reported favourably on it, I understand?—Yes, on the site which is excellent; there is a gorge 300 feet deep and very narrow, but the water cannot be led anywhere where it would be used.

65. Q. Do you know if anything can be done for Parasgad?—Parasgad is particularly hopeless. There is deep black cotton soil there. I have known it as deep as 100 feet. I built a well recently near Parasgad 100 feet deep in a village in which there was no water, and there is not a drop in it at the present moment. It is situated in the south-eastern part of the taluka.

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66. Q. I suppose it is not a suitable place for wells?—No.

67. Q. If the Gokak extension were taken up do you think it would absorb the resources of this district, as regards labour?—Yes.

68. Q. If it took 15 years to carry out it might prove a good form of famine relief work?—Yes, as far as the canal itself is concerned, but I do not see how famine labour could be employed on the tanks. The northern part of Parassagad is very rocky, the soil is red and there is no trap. You can go 60 feet deep through rock without getting water.

69. Q. (Mr. Muir-Mackenzie.)—It is red rock of a particularly hard kind, but not trap. What do the people do to get drinking water?—They go 6 or 7 miles for it.

70. Q. (Mr. Higham.)—What is the amount of estimate for the Gokak extension scheme?—Has it been regularly estimated or are the estimates only approximate?—The canal was originally estimated for in 1868.

71. Q. And the tanks?—The tanks were estimated for at various stages in 1884 and 1886.

72. Q. The amounts given in Mr. Beale's report on page 333 may be taken as fairly accurate?—Yes, they were arrived at in 1886.

73. Q. Have they been revised in any way since?—No.

74. Q. Is there not a tendency now to raise the rates then fixed?—No, the rates, if anything, have been reduced for masonry.

75. Q. Before the project could be sanctioned, the details would have to be worked out?—Yes, the figures would have to be recast. The land compensation, which is much heavier now, would affect the question much more than the question of rates.

76. Q. Have trial borings been made?—Trial pits were taken down to rock.

77. Q. On the regular longitudinal section of the dam?—Yes.

78. Q. Merely a general estimate, I suppose, has been made for the work?—Yes, lump sums have been estimated for each outlet.

79. Q. What about the weirs?—They are subsidiary weirs to act as water cushions. Except the Aralundi, the dam of which is proposed to be of earth, the tanks at Beniwad and Hadalgi are to be masonry, and the water will flow over the top like the Gokak weir.

80. Q. I suppose no drawings have been worked out?—No, not in any detail.

81. Q. Supposing it was decided to carry out this 91 lakhs project which would take 15 years to complete, I suppose the dam could be carried out and brought into use gradually. For instance, you have a lot of *kharif* irrigation on the Gokak, could you extend that irrigation at once by constructing this section No. 2 of the Gokak canal?—Yes, the work could be done in sections and we could increase irrigation at once.

82. Q. I understand that you can increase the *kharif* irrigation without any storage tanks so that as you finish each weir you can extend irrigation. So that you can really start irrigating additional areas in the next two or three years?—Yes.

83. Q. I cannot find that any allowance has been made for the loss of water.

(To Mr. Beale.)—I think there must be some mistake in the figures on page 331 of the Report on Bombay irrigation.

Mr. Beale explained that allowance had been made for loss of water in the 200 miles by taking 12 acres per million for the first scheme instead of 18, and less for the second and third schemes.

84. Q. Is the loss on the present canal considerable?—Yes, it runs through murau.

85. Q. The new canal would irrigate the same kind of soil as the present canal?—No, not all through, some is black cotton soil.

86. Q. You say the compensation will probably be much more than formerly?—Yes, as two of the tanks will have to be in Kolhapur territory.

87. Q. The Aralundi will be partly in Kolhapur?—I am rather in favour of the Beniwad and Hadalgi schemes. Hadalgi is entirely in the Kolhapur State.

88. Q. Have you taken up land before for tanks in a Native State?—Yes, the Bhatgarh tank is in the Native State of Bhor.

89. Q. Has the Kolhapur State been approached on the subject?—There was some correspondence, but nothing definite was settled.

90. Q. Why should not the compensation take the form of an annual charge on the land taken up instead of purchasing it outright?—I am afraid I am not competent to answer the question. I do not know if the land could be rented from the Kolhapur State. I dare say it could be done.

91. Q. Would it involve a transfer from the Secretary of State?—I know that the land through which the Periyar runs in Travancore is only rented from the Mysore State.

92. Q. I thought that was the case also at Bhatgarh.

Mr. Beale explained that the land at Bhatgarh has been purchased.

93. Q. Apart from the Gokak canal the most promising scheme is, I believe, that proposed at Kokatnur?—Yes, Kokatnur seems a promising scheme.

94. Q. Do you think it should be carried out?—I think it might be carried out as a protective work. It would not do as a productive work, as much of the command is black soil and a good deal of the water would not be used in good years.

95. Q. What would it cost?—The cost would be about 6 or 7 lakhs. The height of the dam would be 40 feet.

96. Q. The work might be planned out and kept ready as a famine work?—Yes; it would be a very useful famine work.

97. Q. Are there any other tank projects which might be treated in the same way?—If the Durdundi is to be carried out, the earth dam could be made by famine labour.

98. Q. Could not famine labour be employed on all of them with advantage?—No; the Markandya would be a masonry dam.

99. Q. That might wait till you finish the Gokak extension. It must stand on its merits?—Yes; I think so.

100. Q. It has been reported that you have repaired 38 of the small tanks in this district?—Yes; the number must be 50 now.

101. Q. And some 400 remain to be done, what are the repairs which have to be effected?—We have some 410 of our hands. These small tanks are without waste weirs and have no outlets, there is seldom any pitching, and in some cases the dams have been breached.

102. Q. What is the average height?—Maximum about 30 feet, average about 20 feet.

103. Q. They silt up a good deal, I suppose. Have you attempted to clear them?—No; I have raised the dam 2 feet and find that is the cheapest way. That sometimes means submerging good land beyond.

104. Q. Are any objections made against raising the dams, and submerging lands?—In some cases we have to pay land compensation. The people in this district are very land-hungry.

105. Q. I should have thought that in small tanks like these, compensation would not be necessary?—In some cases the people are not compensated. They can then cultivate only in the *rabi* season and so lose the more valuable (*rico*) crop.

106. Q. Do you buy the land out?—My plan is to purchase the land and then resell it.

107. Q. Would it not suffice to pay compensation for the loss of a crop and leave them the land to make what they can from it?—No; we generally have to purchase the land.

108. Q. What advantage does that have over paying compensation for loss?—We probably get a better bargain.

109. Q. The alternative would be to acquire the land?—They make unreasonable demands when I offer compensation for loss, but when I want to purchase they come to terms.

110. Q. When you raise the dams you have to purchase the land?—Not always. The rayats sometimes come forward and say "raise the dam and we will pay the land compensation." We, however, cannot accept more than 10 per cent. of the cost of repairs. We might leave them to settle the compensation with the owners of the land that is likely to be submerged.

111. Q. The repairs consist of raising the banks, making waste weirs and repairing the outlets, where necessary?—Yes, sometimes when the water level has been low for a very long time the Revenue Department lets out the land under the tank to a cultivator, and then, when, I raise the dam, I have to acquire the land.

112. Q. The moral is to let them make their own arrangements?—Yes, but if we do not restore the tank we have got to give up the assessment.

113. Q. Have you given up the assessment in many cases in this district?—No, not to my knowledge.

114. Q. Suppose the water level falls, you do not give up the assessment, but let the land to another cultivator?—Yes, but this could only be done at dry crop rates.

115. Q. Do you let the land?—No; the right of occupancy is sold.

116. Q. What about the Gadikeri Tank?—It is a large second class work.

117. Q. Has anything been proposed in connection with improving it?—It cannot be improved, it irrigates all the land it is possible to irrigate.

118. Q. What about the silting up of the small tanks?—They silt up considerably.

119. Q. What is the ordinary life of one of those tanks?—Most of these tanks must be 100 years old.

120. Q. I suppose they have got a lot of silt in them?—Yes.

121. Q. (Mr. Ibbetson).—You say that in 1896-97, there was a good supply of sub-soil water in Athni and good food crops were obtained under wells, but that the water went down considerably by 1900, due to a succession of dry years?—Yes.

122. Q. Is there much well irrigation in Athni?—There is a fair amount, but it is diminishing a great deal.

123. Q. In ordinary years there is a considerable amount?—Yes; the people thoroughly understand wells.

124. Q. Do you think that the area under wells could be increased?—Not under present conditions.

125. Q. Supposing the sub-soil water rises again?—If the sub-soil water rises again, there would, I think, be a large increase, owing to the amount recently spent on wells.

126. Q. Is there any considerable portion of the taluka where wells cannot be made?—There are, I should say, no parts unfit for wells, except near the Krishna, where they are not required.

127. Q. What is the ordinary depth of water?—In 1896-97 it was 30 feet.

128. Q. Is all the soil fit for irrigation or is there a good deal of deep black cotton soil?—There is some deep black soil on the Krishna, but in other parts irrigation from wells would be profitable on black soil.

129. Q. What are the chief crops irrigated under wells?—Juar, maize and fodder for cattle also wheat and sweet potatoes.

130. Q. Is that in ordinary years?—I am speaking of famine years.

131. Q. What do they grow in ordinary years?—Garden crops, sugar-cane, etc.

132. Q. If the area of wells were extended, would manure and capital be available?—There is not sufficient manure in the country. It would be a good thing to import fish manure. I have spoken to the people, who say that they would buy it.

133. Q. Are the people of this district fairly well off?—Under the Gokak canal the people are well to do now-a-days.

134. Q. I mean apart from the canal tract?—Athni is almost depopulated, 40 per cent. of the people have emigrated.

135. Q. (Mr. Muir-Mackenzie).—Was there a large decrease in the 1901 census from 1891?—Yes, a considerable decrease.

136. Q. (Mr. Ibbetson).—The place is quite ruined?—My present experience in Athni is that there is great difficulty in obtaining male labour, only the women are left, but with a couple of good seasons the taluka would recover very largely. The Krishna floods considerable areas.

137. Q. You have, I dare say, had a good deal of experience in sinking wells?—I have sunk 30 or 40 wells in this district.

138. Q. On account of the Public Works Department?—No, generally on account of Local Boards, I am now constructing some for the Local Board.

139. Q. What do these wells cost?—Some have cost Rs. 4,000, some can be made for Rs500.

140. Q. Under what circumstances would wells costing Rs500 or Rs600 be possible?—Where you can get water, without having to excavate largely in rock, at a depth of 40 feet.

141. Q. Are those conditions at all common in the district?—Not at present; they were before in Belgaum.

142. Q. And in the insecure part?—In Paragad the water is seldom less than 80 feet down. I have had to go down as much as 110 feet. In Athni it is much nearer.

143. Q. In Athni, could a *pukka* well be built for Rs500 or Rs600?—A *pukka* well there would cost Rs1,000 with masonry on the *mot* side.

144. Q. Have you any experience of dry masonry wells?—Yes; I built one in my own compound here.

145. Q. Do you know how it would last as compared with lime masonry?—A dry masonry well should last as long as a well built with lime masonry, but the thickness is about double, *viz.*, 2'—6" against 1'—3" except with laterite which is easily dressed.

146. Q. Which would be the cheaper in the end?—Lime masonry, except in laterite, where you can have a thin stoning.

147. Q. One well would last as long as the other; that is almost indefinitely?—The fault is that the people build them round instead of square. Round wells are better.

148. Q. Round wells built with masonry would last for ever?—Yes, practically for ever in hard trap; in laterite I would not give any guarantee.

149. Q. Would it be safe to assume 50 years as the life of a well built well?—Fifty years would be a very safe figure, it would last for more than that; even 100 years would be a safe figure.

150. Q. At any rate 50 years would be quite safe?—Yes.

151. Q. By a well built well, I mean such a well as a *rayat* would build?—As a rule the *rayat* uses very bad stone and worse mortar.

152. Q. Take the ordinary *rayat* who will not use very well dressed stone and not first class mortar, would it be too long to assume that such a well would last 50 years?—If built circular and twice as thick as I should make it, it would be safe to assume 50 years as the life of such a well, if founded on rock and not on muram.

153. Q. Wells are generally built on rock in the Deccan?—Yes; but in other cases I have reached no foundation after going 100 feet deep. I have built a well in Paragad on curbs. At Yedravi, there is a well 100 feet deep, founded on a curb, without any water. I have brought water down into a cistern in this village from a cave upon the hill above it.

154. Q. What do the curbs rest on?—Some rest on an alluvial deposit; here in Belgaum it is a kind of ochre clay, and in Paragad black soil. We have a great variety of soil in the district.

155. Q. I suppose the life of these wells is very precarious?—Yes.

156. Q. Is all the available water on the Gokak canal used every year; is the demand in excess of the supply?—Yes.

157. Q. Even in a year of good rainfall?—Yes; even in years of good rainfall. But sometimes we might get some water we cannot count on by thunderstorms.

158. Q. It would not be for want of demand that you would not use all the water available?—No; the demand is in excess of the supply.

159. Q. What is the proportion of cane irrigated?—The proportion of cane to other crops is small, because in the hot weather I have only 6 cubic feet per second of water to give.

160. Q. You can give an eight-months supply, I suppose?—To a limited extent only. I have to husband my supply so as not to draw upon my reserve for the mills. The proportions of irrigation to the various crops are as follows:—

Perennial	2 per cent.	Rabi	49 per cent.
Kharif	16 per cent.	Monsoon	33 per cent.

161. Q. What crops do the people irrigate in the monsoons?—They grow *juari*, *bajri*, *kulti*, *ragi*, *tur* and chilies.

162. Q. A good deal entered under monsoon crops is really garden crops?—The principal four-month crops are onions, garlic, etc.; they grow them even in the *rabi* season though they are four-month crops. In the monsoon we charge them *rabi* rates as well as in the *rabi* season.

163. Q. On your canal how much of the *rabi* cultivation is ordinary food crops and how much high class crops?—Fifteen per cent. is garden crops and the other 85 per cent. cereals—millets and pulses. This has been the proportion in more recent years, but in other years the proportion of

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164. *Q.* You say that you refuse applications for garden crops. Are these applications submitted every year?—I refuse perennial crop applications, but up to the present I have not refused garden crops.

165. *Q.* Suppose that a man has a field of *juari* and he puts off applying for water on the score of expense till the very last moment, if the permit does not come until after 10 or 14 days, he may lose his crops altogether. What does he do then?—The cultivator takes the water and sends in his application afterwards. I have fixed dates beyond which no man may take water without being charged double rates.

166. *Q.* In that case they take the water without leave. Then, what is the object of the application?—I cannot prevent them taking the water.

167. *Q.* It is not by your permission that they take it without waiting?—They take it before they get permission.

168. *Q.* That is, in effect, that they help themselves to water, whenever they want it?—Yes.

169. *Q.* What is the use then of having the application system at all?—The application is a check on the establishment and prevents surreptitious watering escaping attention.

170. *Q.* They would have to pay any how?—We would not know when they took the water.

171. *Q.* If a man were going to take water illegally, do you think he is going to tell you?—No, but if he is found out he has got to pay double rates.

172. *Q.* We have been told that the reason for the application is that you know the demand you have to meet and how much you can guarantee. You want to know how much you can pledge yourself to supply?—It would come to this if we did away with the applications: the people might exceed the limit of the water-supply.

173. *Q.* I suppose you have some system of rotation; could not restriction be applied by cutting off the supply for longer periods?—I could not regulate the amount of water to be sent down for any section.

174. *Q.* You mean you might send down more water than is wanted?—Late rains come in October, when the *rabi* crop is starting, and we would be very much in the dark as to what the cultivators were doing.

175. *Q.* You can tell whether a field has been irrigated and how much water has been used?—No, you might get a shower in between.

176. *Q.* Do you know that the whole of the area in Upper India is so irrigated?—My experience is that you cannot tell after a week, especially if rain has fallen in the interval.

177. *Q.* You trust to the people applying in order to render themselves liable; that does not seem to be a sound system?—The *rayats* always are trying to get the better of you.

178. *Q.* You do not think that the system of application could be abolished?—If you did, the revenues of the canal would suffer.

179. *Q.* Do the people take water without permission and pay double rates?—Yes, they take a good deal, they do not mind the double rates.

180. *Q.* What is the proportion of the area on which the people pay double rates?—About 5 per cent.

181. *Q.* I understand that village tanks are at present divided into second class irrigation works, which are maintained by the Public Works Department, and other tanks which are managed by the Revenue authorities?—No. There are three talukas in which there are such tanks. There are 410 tanks, excluding the *inamdars* and 'one-man' tanks. All these tanks are entered in the list under the scheme for repairs. They are all liable to be repaired by this Department.

182. *Q.* I am speaking of the prescribed classification?—There is no limit as regards size.

183. *Q.* Do the present orders as regards repairs of tanks include all tanks?—Yes, all tanks, with the two exceptions named, have to be maintained.

184. *Q.* All have been brought under the scheme for repairs?—Yes.

185. *Q. (Mr. Higham.)*—Even those under fifty acres?—Yes; what I do, when I get an application from a number of *rayats* for repairs to their tank, is to see if the cost of repairs is less than ten years' revenue. In that case I apply to the Collector, and, if he approves, and I find that there is a balance in the allotment for repairs, I put the work in hand after the estimate has been sanctioned. When it is repaired, I hand it back to the *rayats* to maintain. I keep an eye on the tank, and tell them that they must keep it in repair. And if they do not do so, I report the case to the

Collector, who, however, tells me that he has no legal power to force them to repair their tank. Sometimes I again repair the tank, and ask the Collector to recover the cost.

186. *Q.* Has it been collected?—Yes, it has been in some cases.

187. *Q. (Mr. Ibbotson.)*—Do you think that Government should legislate to give the Collector power to get these small repairs carried out?—I do think so.

188. *Q. (Mr. Rajaratna Mdlr.)*—You say that the *rayats* are allowed to take water without previous application?—Yes.

189. *Q.* Is that confined to any particular work, or is it a general rule?—I have only one canal under me and my statement is confined to that.

190. *Q.* The measurement of the irrigated area is done by a measuring staff. Is there any check on them?—Yes; the Sub-Divisional Officer has to check 10 per cent., and I check some myself.

191. *Q.* Is there any room for fraud?—Yes; I have found that large areas have not been measured at all. In one case, two years ago, we found that a measurer had taken Rs500, and let off land on which the water-rate would have been Rs1,100.

192. *Q.* He takes his 10 per cent.?—Yes, and very often more.

193. *Q.* What is the range of a Divisional Officer?—About 12 miles.

194. *Q.* What is the range of each measurer?—We have two measurers, one does 6,000 acres and the other man 4,000 acres, but he has other duties in addition.

195. *Q.* Could not an arrangement be made with the *rayats* to settle the area of permanent irrigation?—I had stones fixed for the sub-divisional numbers so as to obviate measurement, but I found that the people moved the stones.

196. *Q.* Is there no Boundary Act?—Yes, but that does not deter them. It does not apply to stones fixed by the Public Works Department.

197. *Q.* Could not the Survey Department demarcate the boundary, and they would then be liable to prosecution?—Yes, but that will require some consideration. As the stones were being constantly moved, I stopped the system of sub-divisions.

198. *Q.* In regard to petty tanks, do you take them in hand and repair them as required, or do you wait for the *rayats* to apply?—I prefer to do the tanks for which the *rayats*' applications are submitted.

199. *Q. (Mr. Muir-Mackenzie.)*—You have not found the 10 per cent contribution system an obstacle to your spending your full allotment for repairs?—No, the *rayats* have in every case contributed the 10 per cent. The allotments are not large. They only average Rs15,000 a year.

200. *Q. (The President.)*—If these tanks are scattered, the Public Works Department cannot control the work on them very well?—In my district the tanks are in a compact area; there is some difficulty with the labourers sometimes.

201. *Q. (Mr. Rajaratna Mdlr.)*—How many one man tanks are there in your district?—I cannot say.

202. *Q.* Is the number large?—I have no idea. They are not in our lists at all.

203. *Q.* Is any reduction of assessment granted to a man who owns such a tank?—I do not know, the Collector can answer that question.

204. *Q.* You have referred to circular and square wells; what is the increased cost of a circular well as compared with a square one?—The circular one is less costly.

205. *Q.* Would not the stones require to be properly dressed for a circular well?—Even then the cost is less.

206. *Q.* If the *rayat* finds they cost less, why does he not build them?—They would prefer them, but they do not understand how to build them. An ignorant man can build a square well. Some skill is required to build a circular one. Skilled labour is not available. The *rayat* may make a round well that will last 10 years, but I refer to the well which would last 50 years.

207. *Q.* Referring to the Gokak canal, what area could be irrigated by the supply now given to the mills?—It depends on the distance from the tank. I think the supply given to the mills would irrigate 30,000 acres, on the basis of the present 20 cusecs irrigating 5,000 acres.

208. *Q.* Would it be possible by some contrivance to bring back the supply from the mills to a reservoir?—Not unless you pump it. The fall is 180 feet.

209. *Q.* As regards the proposed extension of the canal, will that increase the area and the revenue?—Yes, 2½ per cent. would be the return on the large scheme which will cost 91 lakhs.

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210. Q. What sum has been spent on the Taosi tank?—Rs2,93,000 altogether, including land compensation. We have sold back the land since.

211. Q. How much did the land fetch?—I do not know.

212. Q. Were not trial borings taken?—Trial pits were made, but no borings. It was started in a hurry during the famine.

Witness to President.—I would like it placed on record that I was very strongly opposed to the starting of the Taosi tank project.

213. Q. Are you familiar with field bunds or *tals*?—I have seen many *tals*, but I have never built any.

214. Q. Could a survey usefully be made in the interests of the *rayats* in regard to works of that description?—Yes.

215. Q. Would you utilize famine labour on them?—No, they would be too scattered. They ought to be put under Civil Agency.

216. Q. Would you have those *tals* designed by skilled agency?—Yes, one plan would do for all. I would have the sites fixed by surveyors employed under the Collector.

217. Q. Do you think that the programme of *tal* works might be drawn up in time to be included in works to be carried out by famine labour under Civil Agency?—Yes. The best kind of Civil Agency works would be the building of *tals*.

218. Q. Do you think that they could be utilized to a sufficiently large extent to supersede large Public Works in the famine?—I do not think so.

219. Q. Do you think that they should be erected on private lands and that the owners should pay something as they do in the North-Western Provinces where they are called "aided works"?—It might be considered.

Mr. Ibbetson.—I do not think it would work very well. The conditions are different in the North-Western Provinces; there are big *zaminars*.

220. Q. Do you think that efforts might be made to extend *tals* as a protection against famine?—Yes, with the help of *takavi* a great deal might be done. But in this district they have exhausted all the *takavi*. There should, I think, be some law to enforce that the money advanced should be spent on the object for which it is granted. There ought, I think, to be a special establishment to look after *takavi* loans.

221. Q. (*Mr. Ibbetson*).—You are referring, I suppose, to *takavi* given out in famine years?—Yes; there is no record of the original condition of the well to be improved.

222. Q. In the classification of crops you appear to have two classes, *viz.*, *monsoon-rabi* and *hot weather rabi*. Can you give any idea of the relative proportions of the two classes?—We have practically no hot weather *rabi* crops.

223. Q. Then it may be taken generally that all are *monsoon-rabi* crops?—Yes.

224. Q. Under monsoon crops you have two classes, vegetable and millets; I suppose the greater proportion is millets?—Yes, quite 70 per cent.

225. Q. (*Mr. Higham*).—To come back to the question of applications, I can quite understand that you require applications for *rabi* perennial crops in order to regulate the distribution of your storage. But I understand that the only object of having applications during the monsoons is to prevent the concealment of irrigation?—I was speaking of the Gokak canal; as regards the monsoon crops, the object is to prevent illicit irrigation.

226. Q. You have a Revenue establishment to that each outlet gets its turn for a prescribed time. Could not that establishment, during the *kharrif* season, instead of troubling about how the water is distributed take a note of the fields irrigated?—The establishment of *Patkaris* gets only Rs7 a month each, and excepting the head *Patkari* and two measurers, the men are illiterate.

227. Q. Are they so illiterate as not to be able to do it in their own way?—Yes, they would have to find out the Survey No. and get the map to do the work properly. They are too illiterate for that.

228. Q. Supposing the rule that those tanks the owners of which contribute 10 per cent. towards the repairs should be taken up first, were done away with, how would you determine the order in which tanks should be taken up?—I would take up those tanks most in need of repair.

229. Q. Could you personally investigate which are most in need of repair?—I could do so during my annual inspection, and would give orders accordingly.

230. Q. Supposing a new man came to this district, he would have your notes; but he would have to depend on the subordinate establishment?—Yes, I would call on the Revenue officers for records.

231. Q. Supposing you had Rs3,00,000 to spend on these works, would you have much difficulty in determining which should be repaired first?—The tanks I have repaired so far have generally been the large ones. The others may often cost more than 10 years' revenue.

232. Q. But apart from that, could you repair them all at once; say some this year and some next?—There are very few details and it is hard to get information.

233. Q. There is no systematic record kept of information regarding tanks?—No there are no records.

234. Q. (*Mr. Muir-Mackenzie*).—You were once stationed at Ahmednagar and you are familiar with the Visapur tank. Do you think that that project should be completed or left?—I know the Visapur project, as I practically began it. I have never surveyed the canal, so I would rather not hazard an opinion on the advisability of completing or leaving it.

235. Q. Do you think it will fill?—Yes, I think it will fill with $\frac{4}{5}$ th of the run off in average years.

236. Q. And in bad years?—It would not fill.

237. Q. What is the doubt about the canal; is it because the land is not well suited to irrigation?—I think it is very well suited to irrigation, but a good many of the land owners would not take water in ordinary years. It is in the Bhima valley, and if the people get a good rainfall they would not take the water.

238. Q. Assuming that you had the water which now goes to the mills at Gokak available for irrigation, and you could irrigate, as you say, 30,000 acres, would that be principally monsoon crop?—I meant that I would be able to irrigate 30,000 acres outside the monsoon season—30,000 of *rabi* crops. Perhaps 20,000 would be nearer the figure, as we should have to draw off sooner.

239. Q. (*The President*).—On page 13 of the Report on Irrigation works, Bombay 1901, it is stated "In 1896 Mr. Playford Reynolds as Executive Engineer for Irrigation, Dharwar, suggested the construction by famine relief labour of dams without elaborate arrangements for water tight foundations. A note on this subject by Mr. Dunn, Superintending Engineer, Public Works Department, is attached. It is now suggested again that certain tracts of country would benefit by the construction of what may be called '*kachcha* tanks' formed by bunds, suitably drained to avoid slips, but with no puddle trench. The function of such bunds would be to head up the water for a period and let it escape gradually, thus raising the surrounding sub-soil water level and producing a small and more permanent flow in the *nallah* below." I suppose it is something like a *tal*, only on a larger scale. I notice that on page 15 of the same report you say:—"I believe there was considerable correspondence initiated by Lord Harris' Government in 1892-93, or thereabouts, on the subject of raising the sub-soil water level in wells by means of what are called *kachcha* tanks in your note, and the conclusion arrived at, I understand, was that the results would be incommensurate with the cost." Do you know whether such *kachcha* bunds were made anywhere?—No; nothing more than a *tal*.

240. Q. I gather that something larger was contemplated—such a bund as would retain water for a considerable period when the monsoon is over. It would not do to put a *dam* in a *nallah* as the force of the water would carry it away?—There would have to be made provision for a waste weir.

241. Q. That would be expensive?—Yes.

242. Q. (*Mr. Ibbetson*).—But you save the cost of a puddle trench?—Yes, and you can make them where you have not got sufficient material for making a tank.

243. Q. (*The President*).—It would raise the sub-soil water level and the supply in the storage would also be kept up?—Yes.

244. Q. I think it would be a form of work which might be useful, and it is not costly. Probably the bed would be used for cultivation after the water has been drawn off.

Mr. Muir-Mackenzie.—Such a tank would be empty every year.

245. Q. The water would probably percolate away by Christmas every year, but some crop could then be grown in the bed, do you not think so?—Yes, I think it is worth trying.

WITNESS No. 77.—MR. PURSHOTAM YOGMANDRAPPA PATIAVALI, Gokak.

Mr. Patia-
vali.

9 Jan. 02.

(Examined through an Interpreter.)

1. Q. (*The President*).—You are a landowner in the Gokak Taluka?—Yes.
2. Q. How much land do you irrigate?—I irrigate 100 acres, but if the Gokak canal is extended I can irrigate another 150 acres. I own 250 acres.
3. Q. What do you cultivate?—Maize, chillies, juari and sweet potatoes.
4. Q. Do you grow crops all the year round?—Yes, I grow juari (kharif) every year. I irrigate it in years of drought.
5. Q. Do you irrigate rice?—No.
6. Q. Why not?—It requires much labour and plenty of water.
7. Q. When is rice cropped?—On 15th October.
8. Q. Would not you be able to give the crop plenty of water till then?—Yes.
9. Q. Then why do you not irrigate rice?—Because the staple food of the district is *juari*. Some people irrigate rice.
10. Q. If you irrigate the whole of the 250 acres could you get sufficient manure?—I am afraid I could not.
11. Q. Then, without manure, it would be useless to irrigate the land?—Yes.
12. Q. What manure do you use?—Cow-dung and sheep manure.
13. Q. Do you find that you can get water when you want it?—No, the water-supply is scanty.
14. Q. If you irrigate 100 acres out of 250, can you get the necessary manure?—No, I grow only 50 acres of crop, because I cannot get the manure.
15. Q. (*Mr. Higham*).—When you make an application for water, do you get it?—June 15th is the day fixed for application for kharif crop; but the application has to be made before that?
16. Q. Do you always make it before that?—Yes.
17. Q. Suppose a man wishes to irrigate his field after that date, what happens?—He will have to pay double rates.

18. Q. Do many people apply after the date fixed?—No, they apply before the date fixed. No applications are filed after June 15th.

19. Q. Then if a man wants water after that, he would take it without applying?—Yes, but he would have to pay double rates.

20. Q. Are there many people who do that?—In a year of drought, when the people fear that rain will not come in time to save their crops, about 40 or 50 people would do so.

21. Q. Suppose a man applies for water, and then changes his mind, and does not irrigate his field?—If he does not take the water, he is not charged.

22. Q. What is the date for applications for *rabi* crop?—15th October.

23. Q. Do the people know the date?—Yes, previous notice is given to the owners of land in each village.

24. (*Mr. Rajaratna Mdlr.*)—Is this notice issued every year?—Yes, annual notice is given.

25. Q. Do you think it will be a good thing to abolish the application system?—I do not think so.

26. Q. You irrigate 50 acres, and you can go on irrigating that until you wish to relinquish?—Different crops are grown by rotation, and, therefore, the application system is necessary.

27. Q. Does the change take place frequently?—Yes, every year. The *rayats* change from *kharif* to *rabi*; the rates are different for different crops.

28. Q. Would the average area of each description of crops be the same for say, ten years or so?—The areas are always changing; an owner may let his land to a cultivator, who would sow according to his own ideas.

29. Q. Are there facilities for sinking wells in your district?—You cannot be certain of getting water.

30. Q. Supposing you could get water, would you irrigate sugar-cane?—Many people have attempted watering sugar-cane from the canals, but have failed, as the water-supply is insufficient.

31. Q. That is why I suggest that wells should be sunk to supplement the canal supply?—Even then, they would not be sure of getting the supply necessary for watering sugarcane.

32. Q. Would it not pay to a certain extent to sink a well to supplement irrigation?—I don't think it is likely that water will be found.

THIRTIETH DAY.

Belgaum—10th January 1902.

WITNESS No. 78.—MR. R. C. BROWN, I. C. S., Collector of Belgaum.

Mr. R. C.
Brown.

10 Jan. 02.

1. Q. (*The President*).—You are Collector of Belgaum?—Yes.
2. Q. How long have you held that office?—Six months.
3. Q. Where were you before that?—I have been in Sholapur, Ahmednagar, Poona, Satara and Kanara.
4. Q. I see that you give in your memorandum at page 315 of Mr. Beale's report, the number of talukas, which are liable to famine?—Yes. I think Athni is the worst.
5. Q. Is there no hope of anything being done there?—No, there appears to be no hope.
6. Q. You refer to the Yadvad, Bhairanhati. Do they come under Mr. Fitz Gibbon's scheme?—I think they would. (Mr. Beale explained that both these schemes have been rejected on account of bad foundations.)
7. Q. You say the portion of "the country lying round about Yergatti is the worst off as regards water-supply and the Imperial irrigation tank work of Yarganvi (entered in the famine programme) would be extremely useful in this tract. Do you think that the cultivators would take irrigation for their dry crops and get into the habit of taking it year after year?—Yes, I think they would, if the Gokak Canal is extended.
8. Q. You think that the extension of the Gokak Canal is a promising project?—Yes even if no storage is made, the *kharif* area would be extended.

9. Q. I understand that a part of the canal has been actually dug?—I have not seen it. I believe it goes across the nallah. (Mr. Beale explained that a good deal of the earthwork had been done during the famine.)

10. Q. Do you think that there is a large field for the extension of well irrigation?—There is a large field for the improvement of the existing wells, as very many new ones have been constructed in the last five or ten years, particularly in Athni and Gokak.

11. Q. Have you given out large advances?—Yes, very large, especially lately. This is the fifth successive year of famine in Athni.

12. Q. What has been the effect of drought on the wells in this taluka?—The people complain that there is very little water in the wells.

13. Q. Have they tried deepening?—Yes, but that was last year.

14. Q. In Sholapur, I believe it is being done?—I do not think that it would be successful here.

15. Q. I see that a large sum seems to have been spent on deepening?—A good deal is entered that has not been spent.

16. Q. I see from Mr. Lawrence's figures that in 1899-1900, Rs. 1,01,211 were given away in takavi. How much of that was spent on wells?—In 1900, out of Rs. 1,58,000 Rs. 37,000 were given for wells.

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17. Q. In 1899 the whole of the Rs. 1,01,211 was for wells alone?—Yes, the decrease last year was largely due to the indebtedness of the rayats, who had taken takavi largely in the previous year, and also borrowed from *soucars*.

18. Q. Do you think they would take it from Government, rather than go to the *soucar*?—They take takavi in preference to going to the *soucar*.

19. Q. How long will it take a man to get a takavi loan? This year, it has been done very rapidly. The District Deputy Collectors went to the villages themselves.

20. Q. Did it take about a month?—As soon as the officer could get to the village, he made an enquiry, and gave the money at once. It depended on how soon he could get to the village. It may have taken a fortnight or three weeks.

21. Q. Was a large proportion of this takavi spent on subsistence?—Yes, a good deal of it was used for the purchase of food, etc.

22. Q. Was there any check on that?—No, not at all.

23. Q. (Mr. Muir-Mackenzie).—Are not the works inspected?—Yes; I visited many of the places myself, and found that the money was used in most cases freely on tanks, improvement of wells, etc.

24. Q. (The President).—Did you give takavi for repairs of small tanks, etc.?—Yes, for *tals*.

25. Q. Are they in general use in the whole district?—Yes, in Athni, Chikodi, Parasgad, etc.

26. Q. Would it be a good thing to give them professional help in laying out *tals*?—Yes, I think it would be a good thing. They apply for takavi for *tals* and are very keen on such works.

27. Q. We had evidence yesterday that the works are so scattered that they would not be of any use as relief works?—I think it might be done by putting a surveyor in charge of the works.

28. Q. Looking to the future, do you know of any better protective work for famine labour?—For a future protection the best thing in these talukas would be the improvement of wells. In regard to Athni, if a tank could be built, it would be an excellent thing. It would provide for a certain amount of labour in bad years, and give a small crop.

29. Q. (Mr. Higham).—Have you anything to say about small village tanks, or second class irrigation works?—I have no personal experience. I have not travelled in parts of the District where they are situated.

30. Q. Did you hear what Mr. Fitz-Gibbons said yesterday. I understood that in many cases, when the tanks do not fill as high as they used to, the land is re sold to the villagers, and that now that it is proposed to repair these tanks and make them hold water, it will be necessary to acquire that land again. Would it not be possible to make some arrangement much less costly than acquiring the land; could we not let the people keep the land, and cultivate it when the water goes down?—Yes; it is necessary to acquire it.

31. Q. Do you think they would be satisfied if you relieve them of the assessment and charge only when they actually cultivate?—Yes.

32. Q. (Mr. Ibbetson).—Of the wells made during the last five years in the insecure tracts, are many *kachcha*?—There are a tremendous number of *kachcha* wells. In Athni there are 42,000 *kachcha*, against 530 *pakka*.

33. Q. They are almost all *kachcha*?—Yes.

34. Q. Even, supposing the people were ready to take takavi to make them *pakka*, the value of the land in most cases would not cover the loan?—The value of the land as now encumbered would not allow sufficient takavi.

35. Q. Do you think it would be worth Government's while to run a certain amount of risk in making advances, in view of the fact that the value of the land would thus be enhanced?—Yes, the making of advances would increase the value of the land.

36. Q. I suppose water would be found?—That is the great difficulty; there is no water in the *pakka* wells.

37. Q. When did the water begin to fail?—In the fourth year of drought.

38. Q. Then you doubt the advisability of Government's running any risk in that way?—I think Government might risk further advances, if there is a fair chance of getting water by some such plan as that suggested by Mr. Fitz-Gibbons.

39. Q. Your only doubt is the precariousness of the water-level?—Yes.

40. Q. You have adopted, in famine times, a procedure which has enabled you to give out takavi much more rapidly than in ordinary times. Was the saving of time due to the summary procedure regarding the enquiry?—The saving in time was not due to the inquiry being less careful, but it was more expeditious, because the Sub-Divisional Officer left his other work and made personal enquiries on the spot.

41. Q. Could they not do that in ordinary years?—They could not afford the time to do it.

42. Q. There is a tract in the south-east, where wells would be impossible?—Yes, Parasgad.

43. Q. Elsewhere could wells be made successfully?—Yes, I think that wells might be distributed all over Athni and Gokak in the insecure tract.

44. Q. You say in your note, which Mr. Beale quotes, that in 1890-91, the whole of the insecure tract suffered from famine. Was that a real famine, like that of 1876-77?—I believe it was not. I can only say from what I have heard from other officers.

45. Q. (Mr. Rajaratna Mdlr.).—You say that the Gokak Canal could be carried across a certain nallah. Could that extension be carried out at once, without waiting for the 91 lakhs scheme?—Yes, it could be done at once without storage.

46. Q. Could a large area be irrigated from it?—I do not know. It goes through a very rich tract, which is not irrigated.

Mr. Beale explained that it depended on how far the canal was carried. Even if it was carried five or six miles, a considerable area would be irrigated.

47. Q. What would it cost to carry it over the nallah. Is it a very broad stream?—I do not know.

Mr. Beale explained that the estimated rate was Rs. 30,000 a mile for the full-size canal.

48. Q. A great deal might be done by the improvement of existing wells?—Yes.

49. Q. Are there many wells which could be improved?—Yes, a large number.

50. Q. Are they now in use?—Yes, many of these wells are now working.

51. Q. Is there any difficulty in getting takavi loans for this work?—The difficulty in getting advances taken is due to the fact that people have already taken so much money.

52. Q. I find from Mr. Lawrence's table that in the first ten years about 15 lakhs were advanced under the Loans Act. Would it not be useful to make a systematic inquiry as to how the money was spent?—It is no use making inquiries as to past work. It would be a good thing to do so in future.

53. Q. Advances are given in a lump; would it not be better to give them in instalments, after inspection of the works; to see that the first instalment has been properly spent before giving a second advance?—I think it would be a very good thing; and would ensure a check on work done in future.

54. Q. On page 320 of his report, Mr. Beale says that the supply to the Gokak Mills will shortly rise to the full limit of 136 cubic feet per second. Is Government bound to raise the supply to that limit?—I do not know what the conditions are.

55. Q. In the commanded area of the Gokak Canal, are there facilities for sinking wells?—Yes, I should think so.

56. Q. A cultivator said yesterday that there were no facilities?—The water-level rises where there is a canal.

57. Q. Would it not be a good thing to offer special facilities to induce the rayats to sink wells?—Yes.

58. Q. That would lead to the extension of perennial crops?—Yes, sugarcane is not grown owing to the uncertainty of the water-supply.

59. Q. I notice that a great many wells have been made in the Gokak Canal area?—One hundred and six new wells were sunk in the Gokak taluka. Two hundred and nineteen *pakka* wells have been built in this taluka during the past five years.

60. Q. (Mr. Muir-Mackenzie).—I understood you to say that your inspection showed that takavi money had been tolerably well spent on works. How do you infer then that much of the money was misapplied?—Large

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sums have been given; and I think, that only a quarter at the most half, has been spent on the works, for which they were borrowed. But I have also seen works on which Rs. 1,000 have been spent, of which only Rs. 500 were advanced by Government.

61. Q. Are you confident that the remainder of the advance did not go towards giving subsistence to the persons employed on the work during its construction?—I do not think that much outside labour was called in.

62. Q. So that the amount might represent the men's own labour?—Yes.

63. Q. Could not any misappropriation have been guarded against by rigorous inspection?—The establishment was not sufficient to place any check on the expenditure during the famine years.

64. Q. In ordinary times, could not inspection be carried out?—Yes, in ordinary years it might be done.

65. Q. Admitting for argument that, in a famine year, there is misappropriation (about this Government has expressed considerable doubt) in ordinary times could this misappropriation be prevented?—Misappropriation will not take place to any great extent in ordinary years.

[(Mr. Ibletson).—The whole question has recently been discussed by the Government of India and that Government has come to the conclusion, that, in ordinary years, the misappropriation is so small, that inspection was not worth keeping up.

(Mr. Muir-Mackenzie).—The Bombay Government has also considered the subject and has come to the conclusion that the amount of misappropriation was very small.]

66. Q. Do you think that famine labour, if employed on *tals*, could be successfully organised and supervised?—Yes.

67. Q. Would you do it by Public Works Department or Civil Agency?—I would like the engineers to advise.

68. Q. As you cannot sink wells in Parasgad, what form of protection would you advocate? Do you think that *tals* would be suitable?—I have not examined the subject.

69. Q. Are there hills where *tals* might be made?—No; the country I have seen is flat.

70. Q. Are there other parts near the hills, where the lands are uneven and where *tals* could be made?—I do not know.

71. Q. As regards Mr. Higham's suggestion of leaving and which might be submerged by the tanks in the ownership of the cultivators would it not be necessary to compensate him in years when he could not cultivate it?

Mr. Higham.—My idea is that the assessment might be abolished altogether, the cultivator retaining the land. It would apply only to doubtful lands which are sometimes submerged and sometimes are not. Let the land be held free of revenue on condition that we can submerge it when we like.

The President.—They would not pay the land tax, even in the years in which they use the land?

Mr. Higham.—That is my idea.

72. Q. You say that the land is so encumbered that you cannot give more takavi advances. Does that apply to the whole district?—No; only to Athni and in Gokak where very little more could be advanced on land security.

73. Q. How much has been advanced?—In Athni Rs. 48,000 were advanced in 1891 for wells and other land improvements.

74. Q. The assessment of Athni is Rs. 1,48,000. Do you think that you have advanced three years' revenue?—Yes.

75. Q. The land is worth twenty years' revenue?—I think so much has been advanced that the ordinary Sub-Divisional Officer would decline to take any risk, unless he has special powers.

76. Q. Is there any part of the famine tract of this district, in which you would advocate the extension of small tanks?—None.

77. Q. How do you account for the large area under wells in Sholapur (92,000 acres) and Ahmednagar (10,100 acres) compared with Belgaum (30,000 acres)?—These two districts are practically of the same nature as Gokak and Athni in this district.

78. Q. But Bijapur is still more so and yet there is very little well irrigation?—I think Bijapur is flatter; in Sholapur there are many ups and downs and nullahs.

(Mr. Muir-Mackenzie).—That would hardly account for the difference.

WITNESS No. 79.—RAO SAHEB NARAYAN GANESH NADGIR, Mamlatdar of Athni Taluka.

Answers to printed questions.

The information refers to Athni Taluka alone, which is a badly affected portion of the District.

Mr. N. G. Nadgir.
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1. *Culturable area, etc.*—The gross area of Athni Taluka, which lies on the northern frontier of the Balgaum District, is 522,118 acres, of which the culturable portion amounts to 466,668 acres. 8,022 acres of land only of this area are protected by irrigation from private wells chiefly, an insignificant portion of 30 acres being irrigated by channels or *pats* from nullahs. The proportion of cultivated area to the area thus protected is therefore 58 to 1 in the normal times. This proportion is still reduced to 69th part in a year of drought like the past year. The taluka is devoid of any Government irrigation works, probably on account of scanty rainfall which is required to keep the tanks with a good supply of water, and of the difficulty of utilising the water of the Krishna River, which flows from west to east throughout the southern portion of the taluka. An attempt was made during the famine of 1896 to construct a large tank by bunding up the Agrani Nullah near the village of Taunshi by famine labour; but the project was abandoned as unsuccessful after incurring an enormous expenditure by Government.

2. The soil of the taluka consists of soft black and "karl" black, masari or reddish light soil chiefly. The soft black soil is suited for almost all sorts of crops, dry as well as garden, requiring comparatively small amount

of rainfall to give moisture, and when it is once completely wet for about two feet deep, it does not require repeated rainfall since it possesses the power of retaining moisture to produce crops; while the "karl" black soil, which is mixed up with particles of limestone or sand, is very hard to communicate moisture. It requires, therefore, more and repeated rainfall and is considered to be of inferior quality, though it almost equals with soft black in all respects when the rainfall is favourable and sufficient. The masari or light soil is chiefly used for kharif or early crops, requiring almost an equal quantity of rain with the "karl" black. It is not suited for the growth of wheat and gram and other late crops. All kinds of soil are suited for producing garden crops by artificial irrigation, and require comparatively small amount of rain for the dry crops they grow. Even about 15 inches of the fall, distributed in the proper seasons throughout the year, is quite sufficient for the production of an average crop, and the failure of this benefit brings about distress.

3. As has been stated above, the area irrigated by wells in the taluka is 8,022 acres out of 466,668 acres of culturable land. It consists of small patches of garden lands in some villages only where water can be reached at a small depth in the wells to allow of the drawing of water by the working of the *mot*. Many villages are void of

gardens owing to the hopelessness of finding water underground. The following table will show the rainfall at the

taluka head-quarter station for the past ten years during each month :—

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Months.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.
	In. c.	In. c.	In. c.	In. c.	In. c.	In. c.	In. c.	In. c.	In. c.	In. c.
January . . . . .	...	...	...	...	...	...	...	...	0 5	0 46
February . . . . .	...	...	...	0 21	...	...	...	...	...	...
March . . . . .	...	0 41	1 68	0 5	...	...	...	0 55	0 24	0 43
April	0 79	1 23	0 28	1 18	0 19	2 25	2 22	2 31	0 73	2 46
May	3 25	6 67	0 96	2 47	4 74	2 32	6 34	1 22	0 20	2 59
June	3 36	6 9	1 73	2 64	1 70	3 34	2 98	1 70	2 85	0 95
July	3 42	2 26	3 10	3 69	2 8	2 43	0 85	0 30	1 95	1 72
August	2 41	6 3	3 90	1 22	2 39	1 16	0 55	0 26	2 43	1 19
September	5 73	2 22	4 14	10 90	0 98	4 80	6 40	12 22	1 63	5 29
October	11 34	5 16	3 65	2 74	1 87	7 21	6 13	0 8	1 84	2 18
November	0 36	1 17	0 60	1 41	0 70	...	0 75	...	...	0 56
December . . . . .	...	...	...	...	...	...	...	...	...	...
TOTAL	30 71	31 24	20 4	26 51	14 60	23 51	26 22	19 24	11 92	17 83

The above will show that the fall has been very scanty and indifferent during a great portion of the period, notably in 1896, 1899, 1900 and 1901, with respect to the seasonableness, resulting in the failure of crops and consequent distress among the people. A good quantity is necessary, especially in July and October at the latest, for kharif and rabi crops respectively, failing which, the crops suffer. In case late rains are at least favourable, much danger is not felt even if the early crops suffer since all available lands can be used for rabi crops. North-east monsoon is generally favourable for the rabi crops, and it chiefly determines the situation of the season.

4. The following kinds of crops are grown in garden land by means of irrigation from wells, and the number of waterings they require are shown against each. They generally require water throughout the year excepting the rainy season, if it be favourable :—

1. Sugarcane ... Twice a week for 11 months from March.
2. Maize ... Once a week for 3 months from May and September.
3. Sweet potatoes ... Once a week for 5 months from August.
4. Wheat ... Once a week for 3 months from October.
5. Betel leaves ... Once a week all the year round.
6. Juari hundi ... Once a week for 3 months from April.
7. Plantain ... Twice a week all the year round.
8. Turmeric ... Once a week for 11 months from June.
9. Juari Kadawal ... Once a week for 3 months from fodder for cattle. April.
10. Chillies ... Once a week for 9 months from June.
11. Vegetables ... Once a week for 3 months.

No irrigation revenue is realized in this taluka, there being no Government irrigational works of any kind.

5. *Black cotton soil.*—Black soil lands are generally very fertile, possessing moisture-retentive power and therefore not requiring repetition of showers. If they are once thoroughly moistened before sowing much rain is not afterwards necessary, and a shower or two during flowering period ensures a good outturn. This soil is useful both for dry and garden crops, and is well adapted for all kinds of late crops, especially wheat, cotton and gram, which do not flourish so well in other kinds of soil. Small tanks constructed in such soil can hold water without any danger of absorption or leakage. "Karl" kind of black soil is conspicuous for water-holding quality without any such danger, and high earthen dams made of it can safely be relied on, though soft black soil embankments may require stone-pitching inside. Masonry core walls may seldom be needed as the

rainfall in this tract is very scanty. Well consolidated dams can be safely put up. But the question is as to the source of water-supply of such tanks. There are no tanks for irrigation in this taluka—probably not constructed owing to the difficulty of securing sufficient rainfall to utilise them. In fact they would be unfruitful job in the plain tract, if undertaken, except in some places by impounding nullahs on the slopes of hills. The black soil land does not, if soft, require irrigation for garden crops during monsoon, only if there is good rainfall; but it does require it in the remaining period of the year. No falling off in the irrigated area of such soil is observed in years of good rainfall owing to slack demand. People have certainly a desire for irrigation works on this soil, but they appear to be almost impracticable owing to want of sufficient rainfall to make them useful. If they would be successful they would indeed be very remunerative like the wells.

6. *Wells.*—The total area irrigated by wells in this taluka is, as stated in paragraph 1 *supra*, 8,022 acres in ordinary years and 6,735 acres in years of drought. The following table indicates the number of new wells, as also old ones deepened or otherwise repaired during the course of the last ten years. It represents also the extent to which their construction and repairs have been assisted by tagai advances :—

Year.	Total new wells constructed.	New wells from tagai advances.	Repairs to old wells from advances.	Amount paid for new wells out of advances.	Advance for old wells.
				Rs.	Rs.
1892	54	19	62	3,815	5,225
1893	50	16	81	4,000	4,925
1894	50	29	47	2,520	1,870
1895	50	15	18	2,430	1,630
1896	70	37	71	10,300	10,455
1897	100	45	65	6,128	10,110
1898	100	17	21	2,300	500
1899	150	150	126	32,011	27,190
1900	120	41	114	5,913	14,145
1901	106	12	65	2,300	5,655
Total	950	381	670	71,717	81,505

7. The total existing wells used for irrigation are reported to be 2,792, out of which about 1,180 only contained water more or less during the past year of famine, the rest having all dried up for scanty rainfall, though some of them have lately received a supply during the present rainy season. No concession of any kind was

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given to the constructors of wells, except that preference was given to them in the matter of giving tagai during the past years of famine. It is certainly desirable to stimulate the construction of new wells by more liberal payments of advances, and attempts are being made in that direction so far as the security for advances and the nature of the soil would permit, as will be seen from the figures given in the table above. Perhaps remission of interest on such advances, if not of a portion of the advance itself, would encourage the people to some extent to construct new wells with advantage on a larger scale. Numerous wells ran dry during the course of past years and most of them were deepened with benefit. Some did fail, or were abandoned, for hopelessness of getting water. The average depth of water in the wells below surface is eight feet, and the cost of *kachcha* wells used for irrigation varies from Rs. 150 to Rs. 500 according to the depth and nature of soil to be excavated to reach springs of water, *pakka* wells of average dimensions cost up to Rs. 2,000. Wells are worked generally with one *mot*, though there are many with two or more, which work only when there is sufficient water-supply in a good year. The area irrigated by a well with one *mot* is from 2 to 3 acres of garden land. Some attempts have been made in the taluka by boring with a crowbar in the hard rock, under the native method, down to the water spring, and they have proved successful in some cases and have therefore been advantageous in the seasons of drought.

8. *Relief Works*.—Relief labour was employed in this taluka, mainly on the road works, during the past two years, and the total amount expended on them would be approximately Rs. 70,000 in round sum. The maximum number of workers on one day amounted to Rs. 11,160 during the month of July last. The works were as under:—

Athni-Honavad Road,
Athni-Kagvad Road, and
Athni-Anantpur Road.

9. The Kagvad and Bijapur Provincial Road, which is in progress, is still left incomplete, and its completion is

highly desirable since it connects two important commercial centres, namely, Athni and Bijapur, to the railway station at Shedbal. Great difficulty is experienced for traffic in this taluka for want of good made roads and communication is hampered thereby, which renders the early completion of this road essential. It would tend to increase the facilities of communication, especially in the monsoon, during which time traffic is stopped to some extent owing to the old road getting muddy.

10. I should here mention that a large relief work, namely, construction of a tank for irrigational purposes, was started near Taunshi by impounding the Agrani Nallah during the famine year 1896; but, as has been stated above, it was abandoned after incurring an enormous expenditure. It would be a great boon, as a protective measure, if some way be found out to get this work successfully completed so as to irrigate the lands it would command. This would alleviate the distress to some extent caused by the effects of famine which as of late been unfortunately recurring in this taluka, where the crops have suffered more or less since the famine of 1896.

11. There may also be found in the taluka a few suitable sites to construct tanks for irrigational purposes by bunding up nallahs on the slopes of small hills, though I am at present unable to say whether they would be successful and sufficiently remunerative; but they would prove very useful as protective works. It would be for the professional persons to decide and fix about these works.

12. Before concluding I would with great diffidence suggest, as a layman, an expensive, protective and useful scheme for the consideration of the authorities. It is the construction of a canal passing west to east through the northern portion of the taluka, by diverting the water of the Krishna River by means of a dam constructed at some point in the north-west corner of the taluka near Shedbal. I cannot of course say whether this project is feasible, but if it be possible to execute it, it would afford an everlasting boon to the greatest portion of the taluka and protect people to a great extent from failures of crops so severely experienced during the past famine years.

1. Q. (*The President*).—You are Mamltadar of Athni?—Yes.

2. Q. How long have you been there?—About 2½ years.

3. Q. You have been there during times of drought and famine?—Yes.

4. Q. Since 1899, the famine has been very bad?—Yes. The famine was very bad in 1899.

5. Q. You show that protection by irrigation is only 58 to 1 in ordinary times?—Yes.

6. Q. That is almost entirely by wells?—Yes, only a small portion by channels and nallahs.

7. Q. In paragraph 6 of your printed memorandum you show that the number of wells has increased during the last four years. There seems to be a large difference in the amounts advanced in 1899, Rs. 32,011; in 1900, Rs. 5,913; in 1901, Rs. 2,300; why was there a sudden increase in 1899?—The increase in 1899 was due to the large advances of takavi in the famine.

8. Q. You show in the same table that in ten years, of 850 new wells 381 were made from takavi; more than half therefore, were made by the people without assistance. Did they go to the sowcar for the money?—Some of them did.

9. Q. In 1899, 115 new wells were made from takavi; in the following year, out of 120, only 41 were so made and in 1901, 12 out of 108. Are these wells *kachcha* or *pakka*?—Mostly *kachcha*.

10. Q. How long well they last?—10 or 15 years where the soil is hard.

11. Q. Are they built up on the *mot* side?—Yes.

12. Q. What is the sub-soil. Do you require to go through rock?—Yes.

13. Q. I suppose that just now a great number of wells are dry?—Last year the number was very great; but the June and September rains brought a little water to some of the wells.

14. Q. Is the water level rising?—Yes, it is better than it was last year.

15. Q. You say, "perhaps, the remission of interest on such advances, if not on a portion of the advance itself, would encourage the people to some extent to construct new

wells with advantage." Do you think the interest high?—The interest at 5 per cent. is a little high.

16. Q. But the sowcar charges more than 5 per cent.?—Yes; but if the interest were remitted, many more wells would be made.

17. Q. You suggest that a portion of the advance might be remitted?—Yes, that would be a great boon.

18. Q. Do you think that people would be pleased, if, instead of giving the money, an assessment was charged?—I doubt whether they would take the loan under these conditions, as they would have to pay an annual wet assessment, which would last for ever.

19. Q. Are the wells pretty nearly always used?—Yes, those that contain water are all used. The people do their best to get water; but the supply is very scanty.

20. Q. What are the chief crops grown under wells?—Maize, sweet potatoes and *juari*; also a little cane.

21. Q. What is the chief food of the district?—They maintain themselves chiefly upon *juari*.

22. Q. Do they irrigate *juari*?—There is a special kind of *juari*, which they irrigate, which is called *hundi*. It is only sown in gardens; and is watered.

23. Q. (*Mr. Muir-Mackenzie*).—It is grown in the hot weather?—Yes.

24. Q. Is *kadava juari* grown under wells?—Yes.

25. Q. For grain?—*Hundi* for grain and fodder; and *kadava* for fodder only.

26. Q. (*The President*).—Is there anything that can be done for the Athni taluka, to enable it to withstand famine?—I think that tanks might be tried.

27. Q. You suggest a canal passing west to east by diverting the Krishna river "by means of a dam at north-west corner of the taluka, near Shedbal." Has that been examined?—I do not know.

Mr. Beale.—I examined it. But I think it is impossible from that point. If we strike out higher up, we might do it. It is a question of command and of expenditure. There are two native States through which it would have to pass.

28. Q. I understand that there are not many tanks in Athni?—I could mention four or five old ones that are silted up, but they could be improved.

29. Q. Why are there not more tanks?—The country is very flat. And near the hills water cannot be obtained.

30. Q. Do the people often try boring?—They try; but I know only four or five instances, in which, after going forty feet, water has been found.

31. Q. Do the people do the borings themselves?—Yes.

32. Q. In what proportion do they fail to find water?—In 75 per cent.

33. Q. How much does such a boring cost?—Rs. 50.

34. Q. How deep do they go?—About 40 feet.

35. Q. Not deeper?—Their appliances do not permit of it. They use an ordinary jumper.

36. Q. Would it be a good thing to lend them boring tools?—We have already supplied one; but people could not make use of them. The Public Works Department worked it. They tried it in the compound of the travellers' bungalow; and they succeeded in finding water after going 30 feet with great difficulty at a heavy cost.

37. Q. You say that only eight thousand acres are irrigated by wells in the whole of this district, in which there is four lakhs of culturable land. Do you think, therefore, that there is great room for the extension of wells?—I think you might double the area.

38. Q. Could you go on doubling it, till you make it ten times, provided you had manure?—It is difficult to find sites. The people would have gone on building wells, but for this, and also for the fact that many have built, but failed to find water.

39. Q. (Mr. Ibbetson).—You say that in some villages water can be got at a reasonable depth, and the people there have wells; but that in others the water is too deep, and, in consequence, three quarters of the people who sank wells failed to get water. In what proportion of the villages is water obtainable?—In about half.

40. Q. In villages, where wells are possible, can they get water all over the villages?—No, they would have to select proper sites.

41. Q. In those villages, where it is possible, would they be able to sink wells in half the area?—No; there are small patches of from one to two acres.

42. Q. Then wells are not possible in more than one-quarter of the whole area?—No.

43. Q. Your takavi advances average Rs. 200 per well; are those *kachcha* wells?—Rupees 200 is enough for a *kachcha* well about 30 feet deep.

44. Q. Would that well have masonry on the *mot* side?—Yes.

45. Q. How much will it cost to make that well *pakka*?—About Rs. 1,000.

46. Q. Would it be made by dry masonry?—They do not use dry masonry generally.

47. Q. How much of the 30 feet that they have to dig would be rock?—About half, the other 15 feet would be surface soil and muram.

48. Q. And the other 15 feet would cost Rs. 1,000 to make *pakka*?—Yes.

49. Q. Do you think that Government could safely advance money to make these wells *pakka*?—Only if the owners have good security to offer.

50. Q. Have they not got security to offer?—No; lately the resources of the people have been taxed to a great extent. And not more than 5 per cent. have any security to offer.

51. Q. You tell us that a large number of the wells have dried up. What happened in 1899?—There was water till the end of 1900. In the first year they did not fail at all. The September rains of 1899 were very heavy. The failure began in December 1900; and lasted till June 1901.

52. Q. What happened to the wells in Athni in 1896-97?—They were dry; since then we have had successive famines.

53. Q. (Mr. Muir-Mackenzie).—Can you tell us how much takavi has been advanced during the last two famine years?—In 1899-1900, one lakh thirty thousand; in 1900-01, seventy thousand, making a total of Rs. 2,00,000.

54. Q. That does not represent one and a half year's revenue?—No, about one year's.

55. Q. When was the last Revision of Settlement?—In 1886.

56. Q. You have only advanced one year's revenue; what is the value of the land in the *taluka*; was there not enough of security in land for further advances?—We advanced the money only to the poorer people, so as to give them employment. We did not give it to the richer people.

57. Q. But that did not increase the number of wells in the *taluka*, if you gave it to the poorest people?—We might advance more money to the richer people to make wells. The greater portion of the money paid was for other improvements of land.

58. Q. You could not advance much more money to the poorer people?—No, we could not safely advance much to them.

59. Q. There are nine thousand holdings in the *taluka*; and the assessment is two lakhs; therefore, the average assessment on each holding is Rs. 22: well, I suppose, you could very safely advance to a good many of those people twenty times the assessment?—We might advance twenty times the assessment to a selected number.

60. Q. Most of the advances have been given to holders who pay less than Rs. 22. Was not the land of these people already encumbered?—The encumbrances are taken into account.

61. Q. But, if the Government has prior claim, why consider the encumbrance?—We only advance money on unencumbered land, to be on the safe side.

62. Q. Do you think that the greater part of the advances for wells and *tals* has been spent upon the objects for which the advances were obtained?—Yes, most of the money. I personally inspected most of the works.

63. Q. If a man got Rs. 200, how much do you think he spent?—At least Rs. 150, but it must be taken into account that he did most of the work himself.

64. Q. In Athni, what did the people take takavi for, chiefly for wells or for *tals*?—Both, but *tals* consumed a larger amount.

65. Q. Is the country good for the building of *tals*?—Yes; most of the takavi was given for *tals*. The people prefer wells; but they cannot afford to have them.

66. Q. About these four or five old tanks, which you mentioned, were they ever, in former times, used for irrigation?—It is said that they used to be.

67. Q. In what part of the *taluka*, are they situated?—In the north-eastern part.

68. Q. Near the hills?—Near Taosi on the hill side.

69. Q. I suppose they could be used for retaining water in the wells?—Yes, they are now turned into dry crop fields.

70. Q. How many trials were made with the boring machine, lent by the Collector in your district?—Only one; that made in the travellers' bungalow by Public Works Department.

71. Q. How deep did they go?—About 30 feet.

72. Q. That is because nobody knew how to work it?—Yes; the Public Works Department tried; but they could not work it advantageously.

73. Q. From the statistical Atlas, I find a great difference between the lands irrigated in Athni and Chikodi. There is less irrigation in the former than in the latter?—Chikodi borders on the ghats; and there are nallahs, channels and wells there. But, further east, there is a serious falling off.

74. Q. You say that the people think the extension of *tals* better than the extension of wells?—The people borrow for *tals* as well as wells; but the difficulty about wells is to find sites; and when sites have been found, to find water. Therefore, I consider the making of embankments better.

75. Q. Having regard to that difficulty, you think it better to give advances for *tals* than for wells?—Yes; the people know the benefit, and some crop is usually to be had above these *tals*.

76. Q. (Mr. Ibbetson).—You say most of the advances for wells were given in the famine year to the poorer people. In good years, when the water comes back to the wells, will they be able to get labour and manure to grow garden crops under them?—In Athni there is little or no manure used.

77. Q. Do they grow maize without manure?—Yes.

78. Q. So that no difficulty will occur in growing first class crops when the water-supply comes back?—No.

79. Q. (Mr. Muir-Mackenzie).—They will use the manure from the cattle?—Yes; they will use their own cattle manure for sugarcane, as only a very little will be required.

Mr. N. G.
Nadgir.

10 Jun. 02.

WITNESS No. 80.—RAO BAHADUR V. S. KOPPIKAR, District Deputy Collector, Belgaum.

Answers to printed questions.

Mr. V. S.
Koppikar.

A.—GENERAL.

Gokak Canal Irrigation.

10 Jan. 02.

The answers below refer to Gokak Taluka.

1. I have been in charge of the taluka as Sub-Divisional Officer for about nine months.

2. Statement of average monthly rainfall at Gokak is appended.*

3. (1) The following obstacles to the extension of irrigation in the villages commanded by the Gokak Canal arise.

(2) There is no sufficient stock of cattle required for the supply of manure. The rayats are unable to keep large stock on account of want of means and fodder.

(3) *Vide* answer to No. 2. The supply of manure is not sufficient.

(4) All sorts of soils commanded by canal do suit irrigation. There is no obstacle on this point.

(5) Yes. According to the rates now in force, the irrigation for *kharif* and *rabi* crops is not commenced before 15th of June and 15th of October respectively. The supply of water is reduced after 15th of December. Consequently the irrigators of lands that are at a distance from the main canals do not get water regularly. If the reservoir fills in and the supply of water be available, the irrigation for the *kharif* crops should be commenced any time after 25th of May and for *rabi* crops from 1st of October and for summer crops from 1st of February. The period now fixed for the filing of the applications for permission to take water is 15th June, 15th October and 15th February for the *kharif*, *rabi* and summer crops respectively. This limit should be relaxed in times of drought and extended to 15th of September and 15th of November in the case of *kharif* and *rabi* crops respectively.

(6) Yes. But this obstacle can be removed by advance of takavi loans.

(7) Formerly the water rates were very low. They were gradually enhanced from two to four times. The canal irrigation is not, therefore, availed of for the total irrigable area in the villages where canal passes.

(8) Yes. Especially in the case of lands owned by non-agriculturists and Inamdars.

(9) On account of droughts agriculturists and agricultural labourers from affected parts have come to the canal villages and have taken to cultivation.

1. List of such persons is appended. The rayats of the villages adjoining the canal villages earnestly desire the extension of canal to their lands. The Gokak Canal with its Shindi Nallah extension irrigates, at present, the lands of 15 villages. If the canal be taken to the north of the Kalloli Nallah the irrigation may be made available at least for the *kharif* crops in many villages. If it be so extended, necessary return on the cost of extension will, it is hoped, be obtained from the water rates since the rayats of these villages are anxiously applying for its extension and on account of frequent droughts to which the villages are liable. The Public Works Department will be in a better position to state why this irrigation is not so extended. This is in my opinion, a matter that necessitates serious consideration and early action, if the extension be possible.

4. Section 107 of the Land Revenue Code guarantees against the enhancement of the assessment in case where improvement to lands are effected by holders of such lands. Improvements at heavy cost, both from private capital and with the assistance of takavi loans, are made in the taluka. Since then no revision is made. Tenants do not generally undertake costly works of irrigation unless they acquire some sort of permanent right over the lands from land-owners.

5. Loans under the Land Improvement Act are freely taken by the people for the extension of irrigation—

(1) The rates of interest are sufficiently easy.

(2) Remission of interest may be granted in case of wells and other irrigation works which fail after the recipient has honestly executed the completion of the works undertaken by him.

(3) Partial remission may also be granted in the case mentioned in No. 2. Rules to regulate the same with necessary conditions seem, however, necessary.

(4) Same as No. 4.

(5) No extension of the period for repayment appears necessary.

(6) Grants-in-aid may be given in exceptional cases where the takavi debtor failed in his work honestly undertaken and thereby exhausted his resources and no further grants under ordinary rules are possible.

B.—CANALS OF CONTINUOUS FLOW.

Answers to Section 7.

The canal irrigation increases the value of the produce as below:—

(1) The two harvests possible within eight months are:—*kharif*, maize, savi, barga, ragi, and navani *plus* second crop *rabi*, maize, onions, sadak, horsegram. The majority grow maize as second crop. I therefore take maize as a guide. By rains 1 acre, on an average, grows 4 "Hairs" (each "hair" is of 160 seers of 80 tolas each) either *kharif* or shaloo *juari* with varieties of row crops along with it about 1 "hair." The value of the produce in normal years is about Rs. 6 per "hair," thus making a total value of Rs. 30 and fodder worth about Rs. 2. By irrigation the first crop of maize yields about 6 "hairs," the second 3 "hairs." The maize is valued at about $\frac{2}{3}$ th of the *juari* rate Rs. 4-8 per "hair"—, thus the total outturn is Rs. 40-8. The fodder when dried up becomes useless and brings almost no value. It is, however, used when still green. I take annas 8 value of fodder. The total value of product is, therefore, Rs. 41. The difference is therefore Rs. 9 or 28 per cent. It should, however, be noted that the growing of the irrigation crop is much more costly requiring manure and constant labour and the net increase may be considered to be 10 per cent.

Note.—The canal irrigation is said to be too cold and inferior to that of well irrigation, and therefore the produce is also less. The produce of unirrigated acre given above is of good land in a year of good rainfall.

(2) The crops that could be substituted are of longer duration, *viz.*—Paddy (five months), chillies, ground-nut, sweet-potatoes, and cotton (seven or eight months), sugarcane and plantain-trees (12 months). In the case of the last, sugarcane and plantain trees, the value of the produce is much increased. Sugarcane yields about Rs. 200 gross value. Plantain-trees bring no income first year, but from the second to fifth year bring about Rs. 225 per acre, sixth and seventh year about Rs. 100, the average of seven years being about Rs. 160. But these crops are not generally grown on account of the uncertainty of irrigation throughout the year, and those that tried are said to have suffered loss. Betel-leaves and fruit trees are not tried. The remaining crops do not increase value or reduce the value, to speak of, if compared with the outturn of maize with two harvests. *Kharif juari* with varieties of row crops is grown by irrigation, and in that case the value of the produce is reduced to about Rs. 25 per acre compared with Rs. 41, the value of two maize harvests. But there is a proportionate reduction in the payment of water-rate.

(3) The yield is not increased by irrigation:—

(a) in a year of ample rainfall, because the canal water is not generally utilized,

(b) in a year of scanty rainfall, the irrigators take water when necessary, and the increased produce, on an average worth annas 8 per acre is obtained,

(c) in a year of drought the crops are grown only by irrigation, the whole yield is an increase compared with crops in the neighbouring affected tracts.

7. Section 8.—The approximate estimate of the increase in the total annual value of the produce due to irrigation—

(1) Rupees 9 on the average of normal term of years.

(2) The prices of staple food grains being doubled, Rs. 108 in a year of drought. But the cost of watching against depredations by affected population and wild animals is much.

Section 9.—The approximate annual average rate per acre paid on account of irrigation is—

(1) By the cultivator, who obtains permission, on application to Government, as water-rate.

- (a) Re. 1 for *kharijjuari*, bajri, navani, *rugi*, sanvi, barga, same rate even if the above are mixed with row crops of tur, kulthi, gram, etc.
- (b) Rs. 2, first crop of maize, first crop of cotton if mixed with *kharijjuari* in rows, onions.
- (c) Rs. 3, rabi maize, horse-gram, sadak, brinjal, vegetables, second crop of onions, garlic, carrot, *rabi shaloo*.
- (d) Rs. 5, paddy, chillies, ground-nut, sweet-potatoes.
- (e) Rs. 8, from 15th February to 15th June to the crops mentioned in clause (C). But none takes water on account of insufficient supply at this season.
- (f) Rs. 16 for the chillies sown for the purpose of transplantation from water taken between 15th of April and 15th of June.
- (g) Rs. 20, plantain trees, sugarcane and betel-leaves. Fruit trees for which water is taken 12 months.
- Note.—No rate above Rs. 20 is levied.

(2) The rent paid by the cultivators to the owner of the land in the form of enhancement is 25 to 50 per cent. more than what it was before irrigation, say, on an average $1\frac{1}{2}$ to 2 times the assessment. The average assessment is annas 4 to Re. 1, and in few places Rs. 1-4 and 1-8. The quality of the soil is mardī, karla, black soil, light black soil, masari (sandy mixed with red soil), sandy land silted up with deposit of black earth and another quality of soil generally called *halmanh* where plantain trees are grown. This soil is generally close by village sites.

(3) The owner does not pay any rate in excess of the assessment, unless he is a partner with the cultivator. The water-rate is assessed on the area actually irrigated subject to the minimum of one acre in the case of crops mentioned in section 9 (1) (a) and in case of rest 20 gunthas. In the case of pot numbers or sub-divisions separately demarcated by the Irrigation Department, the Minima abovementioned is not applicable. There is, however, no sub-division below 10 gunthas.

Section 10.—The private expenditure to bring water to a field depends on the distance of the canal from which the branch is to be taken. The cost is about 4 annas 100 running feet. If public path intervenes, the cost of the construction of a drain has to be borne by the irrigator. The repairs to the canal costs half of the original expenditure and they have to be made once in two years. The cultivator is allowed to do the work if he likes and in case of his default the Irrigation officer executes it, the cost being recovered from the cultivator.

I. To prepare the land for irrigation, the cost depends according to the level of the land uneven or otherwise cultivated or waste from Rs. 10 to Rs. 100 per acre.

II. The cost of preparation of land for irrigation is generally borne by the owner of the land and not by the tenant. The further up-keep is looked after by the tenant, i.e., cultivator.

Section II.—Without manure no crops are obtained by canal irrigation. Manuring by making at least the sheep sleep in the land becomes necessary. No cultivator therefore sows seeds without manuring the land, if the crops are to be grown by canal irrigation. If the sowings are made by rain-water and canal irrigation is availed of to prevent withering of *kharijjuari*, 4 annas crop is obtained. If crops are grown without manure, they do not ripen and generally fail, and the land becomes useless for the further growing of any crops that year.

II. If irrigation be profuse the crops fail, unless enriched by further manuring.

III. Extensive irrigation is not resorted to by a cultivator, the maximum area cultivated being 10 or 12 acres.

IV. The cultivators take care to avoid damaging by frequent irrigation.

V. Water logging destroys crops and makes the soil saltish.

VI. Here and there salt efflorescence is created, and the area under salt efflorescence is about $\frac{1}{4}$ th of the total irrigated area in the villages of Arbhavi and Balobal. In others it is much less.

VII. The land is not spoiled in any other way.

VIII. In the case of the land spoiled, as in VI, salt is created on the surface. The soil tastes brackish, and looks like khari land losing its tenacity. It does not even grow grass. It is generally low-lying ground, and the cause ap-

pears to be due to the constant moisture created by percolation and water logging from the adjoining high lands which obtain irrigation by canal. The sample of surface salt and the earth below are enclosed. No remedy, is as yet attempted. It is, however, thought that if fresh earth be mixed up, the land might again grow crops.

IX. The irrigation is of about 18 years' standing and the land commenced becoming saltish (*vide* No. VI) two years after the use of the canal water, and the area increases year by year.

X. The evil is gradually increasing.

XI. No experiment has yet been tried by draining irrigated fields.

C.—CANALS OF INTERMITTENT FLOW.

There are no existing canals of the sorts. So no answers are necessary for questions Nos. 12 to 21.

22. I consider it advisable to encourage and assist construction by private persons and Inamdars of canals of this sort. This is possible in several villages where there are nallahs which flow high water two or three times in the rainy season even in times of droughts and in villages where there is large number of irrigating wells, which have now failed, on account of failure of the flow of water in the nallahs adjoining them. I think canals of this sort are essentially required and will save helpless rayats from useless expenditure now incurred by them in sinking their wells deeper and deeper with little success. This can be done in few cases by advance of large takavi loans to substantial land-holders, including Inamdars. Government can, however, construct such works in selected places, assessing the water rate on the irrigators who will be benefitted by them.

D.—TANKS.

There are no irrigating tanks and no answers are therefore necessary for questions Nos. 23 to 31.

32. *Vide* answer to No. 22 above.

E.—WELLS.

I have not travelled through all the parts. I have, however, seen the villages in the north, viz., Mudalgi, Mugalkhod, Handigund, Nagnur, Palbhavi, Sultanpur, Shivapur and Khanhatti. These villages have good many irrigating wells, the average depth is from 25 to 40 feet and now nearly half of them have got dry; others have scanty supply. Many of these wells are dependent on the extent of the moisture retained in the adjoining nallahs in these villages. If the nallah water be impounded and tanks made the supply in majority of these wells will naturally increase and the villages will be able to get through famine years without much difficulty.

List of persons that have settled in canal villages to take advantage of irrigation coming from other villages.

1. Lakky Mudakapa, former resident of Gokak, a cultivator, has come into Arbhavi and settled there as tenant of irrigated lands and cultivates 8 acres.
2. Ninga Somana } From Hosur in Hukeri Mahal, cul-
3. Bhuria } tivators, to Arbhavi, cultivate 24
4. Shida " } acres as tenants of Kurbet Desai.
5. Balappa Jivapa. From Hukeri to Arbhavi, cultivates 8 acres, as tenant of Gangabai Gosavi.

There are several other cases.

WELLS.

34. (1) The only water-bearing tract in the taluka is the northern portion called Mudalgi Bhag of the taluka. The nature of the soil is mardī consisting of hard muram on the surface with soft stone-beds below, easily workable. The cost of digging is easy and of masonry construction, much reduced in consequence. This tract consists of (1) Nagnur, (2) Mudalgi, (3) Hallur, (4) Mugalkhod, (5) Palbhavi, (6) Sultanpur, (7) Handigund, (8) Kapalgudi (9) Shivapur, (10) Khanhatti. The surface in these is undulating. The average depth of permanent wells in an ordinary year is 25 feet.

The rest of the taluka has been exploited during the last four or five years from takavi loans. It consists of:—

- (a) The rocky tract to the south-west and south-east, and
- (b) The eastern portion of the taluka.

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The first is traversed by range of hills and consists of sandy surface with hard sand-stones under it. It is very expensive to work in this and then the water-supply is not plentiful. The second is an even stretch of black soil with granite beds under it. The depth of wells in the rocky tract is about 25 feet. In the black soil tract, irrigation is only possible on the banks of large nallahs capable of holding water in their beds. Such nallahs are few and far between. On the banks of nallahs water can be had at the depth of 20 feet. The tracts further from the nallahs are unworkable, even at a depth of from 50 to 60 feet. The only exception to this is the village of Konjalgi which is similarly situated in this respect with the mardi tract in the north. As this tract is most liable to drought, the only thing possible is by damming the nallahs and hoarding rain-water in large reservoirs.

(2) In the water bearing tract the supply of water is both from springs and percolation. Easily as the water is tapped in ordinary years, the supply begins to fall short and the owner has to dig deeper in a year of drought. In this tract the water never gets saline nor in the rocky tract. It is only in the eastern tract where the water is saline, except what can be got near the nallahs.

(3) The average cost of construction in a mardi or muram tract to the north is of a well of $24 \times 24 \times 24$ feet 500 or 600 rupees with 3 yats (leather buckets) over it. In the rocky tract the cost is Rs. 1,000.

(4) A new well constructed will last for about 10 years without repairs; then it will have to undergo small repairs at intervals of five years.

(5) It is raised by means of large buckets made of hide by bullocks on an inclined plane. There is no other device resorted to.

(6) The average area commanded by well for growing vegetable and maize is 4 acres; for growing valuable crop, such as plantain, sugarcane, and betel-leaves, it is possible with one 'mot' (bucket) to irrigate only one acre.

(7) In a normal year almost the whole as mentioned in No. 6; in times of drought one-fourth or less.

35. When this tract becomes irrigated the out-put per acre is increased by one or two processes. It is possible to raise two crops of different kinds, and in the case of maize, the same kind. It also becomes possible to raise more valuable crops, such as plantain, sugarcane and betel-leaves, which is very rare. The out-turn per acre of average soil of unirrigated crop in a year—

	Rs.
Of moderate rainfall is	22
The out-turn per acre of irrigated crop in such year is	40
Difference	18
Unirrigated crop, good soil and good rain	32
Irrigated crop " "	50
Difference	18

(3) In a year of drought, while the out-put in an unirrigated soil is reduced to nought, the value of that in an irrigated area is doubled, though the extent of cultivation is reduced.

1. Q. (The President).—You are District Deputy Collector in charge of the Athni Division?—Yes.

2. Q. How long have you been there?—For nine months.

3. Q. Where were you before that?—I was Mamlatdar of the Dharwar District; and after that, I was Chitnavis to the Collector of Belgaum.

4. Q. You know the Gokak Canal tract very well?—Yes.

5. Q. You say: "I beg specially to invite your attention to the necessity of the extension of the canal to the villages on the north of the Kalloli nallah, for the purposes of irrigation, at least during the rains." Is that the nallah to which the canal has been made?—Yes.

6. Q. I understand that beyond the nallah the earth-work was made by famine labour?—Yes, during the old famine.

7. Q. (Mr Muir-Mackenzie).—Would the people take water in ordinary years?—Yes. They consent to take the water in ordinary years. In this delta, even now they take water in ordinary years from the first section of the Gokak Canal.

37. (1) The approximate annual rent per acre of an irrigated area for good land assessed at Rs. 1-8 is Rs. 8 to 10 (double to treble the unirrigated rates). For middle class land assessed at annas 8 to rupee 1, it is Rs. 5 to 6.

(2) Formerly in the original survey a higher rate was assessed in consideration of water advantage than now in the revision assessment. In the revision survey, however, the large cost of cultivation being considered, the advantage was lost sight of and the assessment is reduced. The rates are paid on the total area commanded.

38. Not in the Mudalgi side (north). In the other tracts difficulties are encountered. Water-tellers are consulted by rayats in order to select the site for a well.

(2) Not in the Mudalgi Circle. In the black soil and sandy soil tracts, sometimes foundation is not secured and the device resorted to in such cases, is to base the superstructures on logs of Pabul-wood. If this is not the case, there is the hard granite or sand-stone, to deal with which the excavation becomes very expensive.

None. The rayats themselves have taken to making borings by means of crowbars 30 to 35 feet in length with great success in the mardi tract. Water spouts are had in such borings, saving thereby the expense of additional excavation.

39. I am respectfully of opinion that in the arid eastern tract the damming of nallahs passing through their field can be done by only rich capitalists who are very rare. Men of ordinary means will not hazard their capital. In cases where the nallahs are public property, complaints are likely to arise from the neighbouring occupants, and the cost is also heavy. Government alone can do the work and charge water rate on those who are benefitted.

As regards construction of wells by Government it is recommended that Government must set an example by excavation in the eastern arid tract, one or two wells for trial. The points to be made clear are:—

(a) Whether sub-soil water can be had by boring. If so, whether near enough to the surface to make it profitable to draw it by means of buckets for irrigation.

Yes. Temporary wells and water lifts are constructed on the bank of nallahs and rivers, more especially in times of drought. They are a protection for cattle by growing fodder and also to men by growing vegetable and cereals. Tagai is given for this purpose and is largely availed of in years of distress, that is sufficient, I think.

The total number of wells and budkis in the taluka are as below:—

	Villages.	Wells.	Budkis.	Total.
Mamdapur Division	19	196	32	228
Aukalgi " .	26	147	111	258
Yadwad " .	39	482	88	570
Mudalgi " .	36	867	66	933
TOTAL .	120	1,692	297	1,989

8. Q. Perhaps they would not take it in the richer land?—I believe they would take it on all lands.

9. Q. (The President).—You say, the "following obstacles to the extension of irrigation in the Gokak Canal arise—(1) there is not a sufficient supply of cattle which are required for the supply of manure. The rayats are unable to keep large stocks on account of the want of means and fodder." Do they use artificial manure, fish or oil-cake?—Only cow-dung and ashes.

10. Q. Why not, don't they know the value of it?—Perhaps, they do not use it because it costs a good deal.

11. Q. We found in other districts that artificial manure was used, and that the people bring up fish manure from the sea-side. Don't they do that here?—The people who do that must be large land-owners. Here there are only small land-owners.

12. Q. You say "all sorts of soil, commanded by the canal, are suitable to irrigation." The canal does not go, then, through black cotton soil?—Yes, there is a small area of black cotton soil, but it is not very deep and is sited to the irrigation of wheat.

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13. Q. You say "if the reservoir fills, the supply of water available for *kharif* crops should be commenced any time after the 25th of May." Do you think that 15th June is too late?—The people commence sowing the *kharif* on May 25th, and the water should commence from then.

14. Q. You say that the *rabi* crop season commences on 15th October; and suggest that it should be commenced on the 1st. There is plenty of water in October. Why do they not commence irrigation on 1st October; why does the irrigation officer not grant them permission earlier?—I don't know.

15. Q. Do the people complain about having to apply for permission?—Yes.

16. Q. Would the abolition of applications be popular?—Yes.

17. Q. Do you think it possible to remove the applications?—It would be better: a uniform rate could then be charged.

18. Q. What is the advantage of the application system when there is plenty of water?—The canal officer wants to know who takes water and who does not.

19. Q. You say, "on account of drought, agriculturists and agricultural labourers have come to canal villages, and taken to cultivation" and you mention only five families in one village?—Five new families have settled in one of the 15 villages in the commanded area. [These were the names available at hand. My enquiry since I gave evidence shows that nearly 100 (one hundred) new families have settled in the 15 villages. They are from the neighbouring villages of the Gokak and also of Chikodi Taluka. The population of the canal villages has also considerably increased while that of the remainder of the taluka has much decreased. May 1902.]

20. Q. You say "section No. 107 of the Land Revenue Code guarantees against the enhancement of assessment in the case where improvements to the land have been carried out by the land-owner." Is this provision of the law generally known?—I think the people generally know this.

21. Q. You say that the "private expenditure to bring water to a field depends on the distance from the canal, to which the branch is taken, and is about 4 annas for a hundred running feet"?—Yes.

22. Q. How do they settle about taking the water-course across another man's field?—It is generally taken through the boundary between the two lands.

23. Q. Don't the people between the canal and the field ever steal the water?—Yes, they steal it sometimes.

24. Q. You say "I consider it advisable to encourage and assist the construction by private persons and *lanmdars* of canals of this sort." Has any application ever been made by the people to build private canals?—Four or five applications have been made. Up to Rs. 1,000, I can deal with the application. Above that it has to go to the Collector.

25. Q. How about the work?—They want to do it themselves. The difficulty is that some *nallahs* do not pass through their own fields, and the difficulty of proprietorship arises.

26. Q. Are there many such cases?—No, only few. I have been encouraging the people to construct such canals and reservoirs to hoard up rain water running down by *nallahs*.

27. Q. You seem to think that it is better than sinking wells?—Yes, but these canals do not run long after the monsoon?—The canals would run till the 15th February.

28. Q. How? By bunding up the *nallahs* and making it into a tank; otherwise the water runs away in half an hour.

29. Q. You say that you can hold water in these channels to 15th February; but in a well, would you not count on water all the year round?—Since the last famine, two-thirds of the wells fail, one-third or a little more are completely dry soon after 15th February.

30. Q. But in ordinary years, the canals would fail, and the wells would not?—In ordinary years neither the canals nor the wells would fail.

31. Q. You say in paragraph 4 of your memorandum that "formerly the water-rate was low; but that it was gradually enhanced, until canal irrigation was much less availed of." Do you think that the rates are too high?—No; the water-rates are not too high to prevent irrigation.

32. Q. But so high that the people will not irrigate as freely as they might otherwise do?—The irrigators complain of the increased rates for *kharif*—*juari*. They were originally 4 annas per acre; but are now Re. 1 per acre.

33. Q. Is Re. 1 generally the rate here?—Yes, there is a great demand for water for *kharif* on the Gokak Canal, and the people think Re. 1 too high. For the *kharif* crop, I think it might be reduced. I think if the rates were lowered, there would be great increase in the area irrigated.

34. Q. Do they not irrigate all that they can now?—No, the whole of the irrigable area is not irrigated.

35. Q. They do as much as they can?—Yes; if the rate is reduced, they would be able to buy manure to enrich the soil to grow better crops.

36. Q. What is a *her*?—It is a measure used here. It is the equivalent of 160 seers of grain.

(1 Seer=80 tolas by measure.

1 Seer= 75—76 tolas by weight and good quality 80 or 81.

1 Seer=about 2 lb.)

37. Q. You say that, even if a man irrigates less than an acre, he has to pay for a full acre?—There is a maximum fixed, and he is charged that rate, even if he irrigates less than an acre.

Mr. Beale explained that this rule applied to low class crops.

38. Q. (Mr. Higham.)—What is a *guntha*?—33 feet × 33 feet, $\frac{1}{16}$ th of an acre.

39. Q. Do the people use manure for everything they irrigate?—Yes.

40. Q. Even moonsoon irrigation?—Yes.

41. Q. What manures do they use?—Cow-dung, ashes and sheep folding.

42. Q. What does it cost per acre?—Rupee 1 an acre on an average.

43. Q. Would they have to pay more per acre, for more valuable crops?—Yes, for richer crops they have got to spend more. As much as 25 rupees are spent on manure for sugarcane.

44. Q. (Mr. Rajaratna Mdlr.)—As regards the period fixed for applications, do you think that the dates are fixed so as to prevent the necessity of double charges?—The date is fixed in order that the applications should be presented. It is also used as a guide for the people to know that after that, water will not be given without double rates.

45. Q. Would you suggest that the applications be abolished?—I think abolition would be better; but extension of time is certainly necessary.

46. Q. You say that the water-rate for *juari* is Re. 1 per acre. Is that for a single watering or for the whole crop?—A single watering is taken.

47. Q. If the crop fails remission is granted. Is that guarantee not sufficient to encourage the *rayats* to irrigate?—No, it does not cover their losses.

48. Q. What proportion of *juari* is dependent on rain and on canal?—In ordinary years, they do not grow *juari* by canal water. Better crops are produced by rainfall; if the *rayats* see that the rain is going to fail, they go to the canal. They take canal water to supplement the rain sometimes, and in the Gokak Taluka, where rain is very seldom seasonable, canal water is usually asked for.

49. Q. Are there sufficient grounds for complaint regarding the water-rate?—The land assessment is 8 to 12 annas an acre, and the water-rate, proportionately, is too high; it should be 8 annas.

50. Q. If it was reduced, would there be a large extension of area?—Yes, specially for *kharif*.

51. Q. How much?—I think the area would be doubled, and there would be no fall in the revenue.

52. Q. Consequently a larger area would be protected?—

53. Q. You speak of the water-supply failing. For how many months does it fail?—From 15th December to 15th June, when the supply is most valuable.

54. Q. Could not the *rayats* sink wells to supplement the canals?—Wells could be sunk; but, if the *rayats* do it, I think only half rates should be charged for irrigation by canal supplemented by well irrigation.

55. Q. Suppose if well water was used for irrigation, and no rate was charged, would that be a good thing?

Mr. V. S. Koppikar. Mr. Beale explained that water-rate was charged, if the well, tank, or Budki was within 200 yards of a Government water-course.

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56. Q. You say that the rates are high for garden crops. If they were made half, would that be high?—I don't think so. I think the people should be encouraged by making the rate very low. When the Gokak Canal was first started no water-rate was charged at all.

57. Q. Suppose exemption is guaranteed for five years, would the number of Budkis increase?—Yes, I think so.

58. Q. Suppose the system of application is abolished, could the *kulkarnis* measure up the area irrigated?—The present establishment is not sufficient for the Revenue authorities to take over the measurements. Besides that the *kulkarni* is not trained as a surveyor.

59. Q. The total irrigated area of your district is only 6,000 acres for fifteen villages, would not the present staff be able to measure that?—An additional circle inspector on Rs. 25 would be required.

[Mr. Muir-Mackenzie explained that the village accountants at present were not able to measure or survey; but that they are being taught, and, after this is done, they might be so employed.]

60. Q. Could they not measure by means of a long pole. In the Central Provinces they do it?—I do not think so.

61. Q. You say that applications for the construction of *bandharas* have been received. What concessions are allowed in such cases?—There will be no enhancement at the next revision of settlement.

62. Q. Are they liable to be charged water-rate?—No.

63. Q. (Mr. Muir-Mackenzie).—Have you inspected any *takavi* works?—Yes, many.

64. Q. Do you think that the money has been faithfully spent?—No.

65. Q. How much has been spent on works, about half?—On an average, half.

66. Q. Where has the rest of the money gone?—The advances have been made in famine times for wells and *tals*—75 per cent. for wells and the rest for *tals*, and a good deal has been spent on subsistence.

67. Q. In the case of wells?—About three-fourths was properly spent, and there are also cases in which people have spent money out of their own pockets.

68. Q. But as regards the rooting up of weeds and *tals* they only spent about half?—Even less may have been spent in rooting up *nath* grass, we cannot check the quantity.

69. Q. In regard to *tals*, there would not be that difficulty?—No, we can measure up the work.

70. Q. In the case of *tals*, they spent half the advance they received?—Yes.

71. Q. Could you force them to spend the whole?—I am doubtful whether we could make them spend the remainder now.

72. Q. It is not difficult in ordinary years?—No.

73. Q. Does the 50 per cent. include the value of the labour of the *rayat* and his family?—Yes.

WITNESS No. 81—Mr. J. E. WHITING, M.I.C.E., Chief Engineer, Public Works Department (retired).

Memo. by Witness.

Mr. J. E. Whiting.

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In seeking to facilitate to the utmost the use of irrigation in order to alleviate famine in years of scanty rainfall (not of absolute drought), it will be necessary to consider systematically the varying circumstances of localities and to choose the system of irrigation that will there benefit the greater number of the inhabitants. In some districts two or more systems may be worked together; but generally it will be found that these would clash more or less, and that it will be advisable to favour one system.

2. The systems may be classed under the following heads:—

1st.—Irrigation by canals from large reservoirs.

2nd.—Ditto by canals from large rivers having perennial flow.

3rd.—From *bandharas* on *nallahs* and streams with perennial or cold weather flow.

4th.—Irrigation by a series of controlled inundations, spreading over large tracts of nearly level land as in parts of Kathiawar.

5th.—From a series of weirs or *bandharas* along torrents and steep tributary streams; channels from these to a series of field tanks, or 'pockets,' being cut on one or both banks for the water brought down by every shower, that causes a run-off, or *freshet*, from the catchment above each weir.

6th.—From wells.

3. Irrigation projects under the first two systems named above are manifestly the first that will be sought for and must be placed (like Railways) under professional Engineers both for construction and maintenance, but not necessarily for administration. At present it seems as if most of the professional skill available could be advantageously employed in seeking for new sites and framing and executing economical and effective designs for storing and utilizing (with a view to the special objects under consideration) water that now runs to waste, and this not only for the large works coming under the first two heads, but also those under the 3rd and 4th, and, as will be shown further on, by initiating and guiding irrigation under heads 5 and 6. In fact it is chiefly under these last two heads that extensive improvement seems feasible. That is say to, when all has been done that can be done under systems 1, 2, 3 and 4, there will be left by far the larger area of this Presidency (excluding Sind) dependent on direct rainfall. If system No. 5 can be extensively inaugurated and No. 6 radically improved and extended, it is believed that a very large amount of what may be termed 'auxiliary' irrigation of districts in years of scanty rainfall can be effected by the

agency of the people themselves, with due guidance and help at first from professional Engineers.

4. It will no doubt be noticed that there is no novelty in suggesting irrigation from a series of weirs or *bandharas* along torrents and tributary streams, and that if these were of much use, the people would have adopted them much more than they have done. Granting all this, it is the more important to explain why this is so and to suggest remedies.

5. The reasons are probably,—

1st.—Because generally these works have been tried for direct irrigation and have been found to supply water just when the people do not want and cannot utilize it, namely, during, or immediately after, each of the heavy showers that bring down the *nallahs*; that is to say, just when the fields are well soaked by the rain itself.

2nd.—The narrow *nallahs*, suitable for these works, have too steep beds to form good storage tanks and the flow in them ceases soon after the rain itself stops.

3rd.—The people would hesitate to co-operate to construct a good bund and channels large enough to lead the water available to a series of tanks commanding their respective farms and so that they could be filled in succession and for use after some days, because they fear that the water will not be fairly distributed. That the first tank of the series will be filled first, then if the flow continues, the second and so on. It will not satisfy them to arrange that at subsequent floods the distribution shall commence at the one previously disappointed; for there may be but one flood; or perhaps not sufficient floods and they may not come equally seasonably. What is wanted is the certainty that the owner of each tank below the channel shall receive his due proportion of each flood. It is believed that this can be guaranteed by a simple and automatic arrangement.

10. These works will need to be professionally designed and constructed with good, though not expensive, materials, put together by the people themselves. No *patkeries* will be required and repairs will be simple and can be done by the *rayats*, who have paid for each work. Records of the levels of the crests and details of the arrangements should be recorded in an Engineer's office; so that any modifications that are found desirable, or that the villagers lower down ask for, can be considered by the proper authorities.

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11. As to the field tanks, these will doubtless leak at first and may eventually silt up; but still the people will be well repaid if they obtain one or two good waterings after each replenishment. Tanks can be cleared out by famine labour and the silt will be useful on the fields. Absorption in the beds of the tanks will either replenish the springs of wells, or pass into the nallah and so be of use at weirs lower down. Probably if this system be adopted generally, a great improvement in the supply to present wells may be anticipated and a larger number may be sunk. Also the dry weather flow in the main rivers will be sensibly augmented, but the volume of floods during storms will be moderated, so that the incidental effects of this system will extend to systems 1, 2, and 3 situated further down; but possibly this system will clash with those others in years of scanty fall—along catchments, for instance, from which works on systems 1, 2, and 3 draw their supply and which are barely sufficient now, it is doubtful whether No. 5 should be encouraged; especially as there is so much of this Presidency, that can never be served by large irrigation works, there is ample scope for system No. 5 without risking interference; but, on the other hand, there are some good sites for large reservoirs, which at present seem barred on account of the unmanageable size of their gathering grounds, the floods from which cannot be dealt with under present conditions, if these catchment areas can all be furnished with bandhara works and moderating field tanks along the tributary nallahs, Government may find it safe to sanction construction of these important storage reservoirs on the main rivers hereafter.

12. The general method of automatic distribution into field tanks that has been proposed for bandharas on nallahs may possibly be adopted for distribution from irrigation canals or rather from side channels to each village below it, so that the canal authorities would need only to periodically discharge into those channels the specified amount of water required to irrigate all the lands, for which applications have been sanctioned there. This water would pass out into distributing tanks commanding those fields as in system No. 5 and be used by the people at their convenience. In this way the services of pateries could be dispensed with and all matters of dispute regarding rotation of supply, etc., to the properties under each tank, could be settled by panchayats. There would be some loss by absorption at these tanks, but less extravagance in the fields to better advantage for all parties. This might simplify canal administration and make irrigation popular and effective, and so justify expenditure on large irrigation works, that would lessen the number of people requiring help in times of scanty fall.

13. The system No. 5 has been described above with reference to cases in which it could be carried out by the people themselves, but it is applicable to larger rivers that have a prolonged flow after storms and a continuous flow after the monsoon; rivers in fact that would require masonry weirs and be worked under class 3 but that their cold weather discharge would not irrigate enough land to repay the cost of the works; if, however, numerous field tanks were constructed below canals from these weirs, their utility after every freshet would make them amply remunerative; in this way system No. 5 may blend with and promote irrigation under system No. 3. The weirs, if provided with ample undersluicing arrangements, may have bridges over them and thus become doubly useful; for details see report on such works in Cutch State. Appendix No. 2.

14. With reference to irrigation from wells it is believed that in districts now protected by canals the existing wells are allowed to go out of use, because of the greater cost of working them as compared with flow irrigation; and this even where the levels of water surface in these wells have been raised by percolation from the canals. In fact the garden lands that have been prepared for well irrigation are often the first to utilize the canal and are encouraged to do so as an example to others by the administrators of the canals. This is all very well so long as there is a surplus of water available, but when failure of rain occurs every drop would be valuable elsewhere, and then it is difficult to induce the rayats to resume well irrigation. It may be found desirable gradually to restrict, for garden land at all events, the grant of canal water to lands that cannot be irrigated from wells; so as to utilize not only original springs, but sub-soil water due to percolation from canals and tanks. The levels of water in wells below projected canals have, it is believed, been recorded with a view to claiming for the canals whatever improvement may arise after admission of the supply; but the results are, of course, not conclusive in cases where the wells have been abandoned, as described above; for naturally, the surface in such would

now rise higher than when they used to be drawn dry, or nearly dry, daily. If well irrigation can be encouraged, not only will more canal water be available for other land, but probably water-logging and the consequent tendency of springs to bring 'Rey' or 'Khar' efflorescence to the surface may be reduced; for so long as drainage is downwards this does not appear; therefore by keeping a constant draft on springs to wells natural drainage will proceed. It seems therefore desirable to make the people understand that the canal authorities will never charge for sub-soil water even if proved to come from their works. This assurance, together with some restriction as to supply of canal water, where wells exist, or can be successfully sunk, would probably save a large amount of sub-soil water from passing away into nallahs or exuding through salt laden strata to be evaporated on the soil; how large the quantity must be, may be estimated from the percentage of loss by percolation in canals of this Presidency.

15. In the present methods of drawing water from wells there is an unnecessary loss of efficiency through friction at the wooden axles of the wheels; this could be obviated by the use of iron axles on roller or ball bearings, or even on brass. If a few improved but simple apparatus were provided, or lent, for illustration, by Executive Engineers on each large work, where the resumption, or increase of well irrigation is desirable, the people might adopt the idea. They might not take up a new pattern, but some simple and easily applied improvement of their present mols, or Persian wheels would have some chance of adoption. Such improvements would be especially appreciated when oxen become scarce and famine labour is plentiful, as was the case in Kathiawar and Gujarat lately. The cattle could be sent away to State grazing lands and a number of persons employed and fed in their place, with much better results than are possible with the present wasteful machinery. There are many wells that are not used, because their owners have become poor, or have lost their own bullocks, but can hire some for ploughing their fields. These could be irrigated by good and light Persian wheels worked by hand power; which would be most plentiful, when most required, namely, in famine years. These abandoned wells and such as will doubtless be constructed, (when the supply to springs all over the country is augmented through a general adoption of system No. 5) will not only increase irrigation, but supply productive employment, conveniently scattered, in time of distress. It may be incidentally noted that, hereafter the neighbourhood of wells need not be unhealthy for relief camps, if the simple methods proposed for destroying the larvæ of mosquitos, that breed in wells and tanks, be adopted; also, that when the amount of sub-soil water has been increased, the position of springs should be sought and located by borings, so that the construction of new wells may be undertaken as productive relief work.

16. Works on systems No. 3 can be constructed with advantage on good sites on rivers below works on systems Nos. 1 and 5, although those sites may have been abandoned after systematic gauging of the perennial flow over them in former years; because they can now utilize in addition the leakage and waste water from the systems higher up; while, on the other hand, the construction of these weirs lower down may give a great value to sites for reservoirs that have been rejected, though otherwise suitable for relief work, by supplementing the apparently limited scope of their utility.

17. There are some sites available for excellent storage reservoirs, that are rejected, because their catchment basins are not of sufficient area to ensure full replenishment every year; and others that would require the run-off due to two or even more average monsoons to fill them; they are rejected, though this average run-off might suffice, if they were once filled, for annual local requirements and to make up annual losses due to evaporation and absorption. That is to say, when once filled they might be relied upon, even after a scanty monsoon, to retain an invaluable supply gathered in previous years for the enhanced requirements of a bad year—for instance, they would then serve to irrigate fodder crops and grazing lands for unemployed plough cattle. If these serious periodical demands be considered, it should in some cases outweigh objections that are put forward against taking up land for reservoirs larger than would suffice for ordinary local requirements. (For an instance see appendix No. 3.)

18. As to the absorption of water on irrigation works it has been noted above that this water should be utilized at wells and weirs lower down; and with regard to evaporation, which seems to cause a daily loss of about 1,000,000, cubic feet per square mile of reservoir surface, it may be noticed that, although not under control, yet it is not all wasted but

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drunk in as vapour by leaves of trees, or as dew by crops in the dry weather. Furthermore it cools the air and thus probably determines and increases rainfall.

19. It may be noted that although a year of actual drought all over a district seems to be unknown, and though the detention and utilization of the rain that does fall in scanty years is what has been the basis of the foregoing suggestions, yet that in some districts the total fall in one year has been known to be so very small that great distress would have been felt in those districts even if all possible advantage of rain, nullahs and wells had been taken; those areas, too, may in future years be even larger. These considerations should outweigh objections that exist to building as many and as large reservoirs as possible wherever heavy rain can be relied upon periodically to fill them, say once in 9 or 10 years; for such reserve tanks seem to be the only resource against extensive periodical failures. A common objection against proposals to provide larger storage than would suffice to hold the minimum or at the outside the average run-off (excluding failures) from any catchment area, is that it would be unwise to encourage the rayats to irrigate areas larger than can be watered from the reservoir thus designed, every year; but, unfortunately, as things stand now, disappointment does occur in years of scanty rainfall, and it is this that gives the opponents of irrigation a strong point, for it enables them to assert that irrigation does least good just when and where most wanted; but this drawback, due to disappointed confidence in the canals to supply their accustomed water, would cease if storage were provided for the water that now runs to waste in good years, and which should be detained not only for use with fodder crops and for the unusual requirements of famine years, but especially to support the credit of the average annual sanctions of water and thus obviate partial impoverishment of those who strive to avail themselves of irrigation works to the utmost. It is not here urged that annual sanction could be increased when a reserve storage has been provided, but that those now *generally* granted may then be *always* granted; and in those cases, in which the policy of establishing new works seems doubtful, that policy could be safely adopted, because the advantages of irrigation would be increased and the drawbacks now affecting the question would vanish. As to the cost of the extra or reserve storage now advocated, a portion of it might fairly be debited to what may be termed irrigation insurance; but by far the larger portion to manifold benefits realized at famine times. Of these benefits, the value of cattle maintained and the savings effected and estimated by comparison with relief expenditure during years of drought, such as those just past, should be recorded, in order to prevent depreciation of precautions during future cycles of plenty.

20. The case of Muswad tank may be quoted to illustrate the foregoing remarks. The catchment area of this tank is so large that in ordinary years the reservoir is very soon filled and much water then runs over the waste weir, but in scanty years it fails to fill. So that the usual arrangements, which the cultivators may have made for wet farming, such as preparing fields, planting sugarcane cuttings, purchasing seed for garden crops and perhaps extra cattle, as well as raising loans for extended operations based on the credit of success in former years, all these break down when the tank does not fill; for then the Executive Engineer has to refuse many petitions for water, and this, too, in a year when their monsoon crops have failed! Thus the rayats who have gone in for irrigation and had good prospects suffer more than others. Such cases, of course, tend to destroy confidence in irrigation projects, as regards protection in times of drought, except where the tanks have unfailing ghat catchments; whereas, if the second tank that has been proposed were constructed with, say 140 square miles out of this enormous catchment, and to hold, say 3,000,000,000 cubic feet, and although it might take two or three years to accumulate this reserve (for whenever Muswad tank did not quite fill, water would be let down from the new tank to make up the deficiency) yet it would re-instate the credit of that work with the people. The supplementing water would not be let down until all chance of natural replenishment had ceased, so that no available storage room might be wasted. The deficiency in Muswad might at the end of a bad monsoon appear greater, because the run-off from those 140 square miles had been intercepted, but the water would be available and it is manifestly wiser to store it in the upper basin till the end of the monsoon, as explained above. But so soon as Muswad tank has been assisted to its full supply level, a portion of the remaining reserve in the upper basin could be devoted to alleviating distress, when necessary, either along the banks, of the river above Muswad, or below it as might be desir-

able. It appears then that with sufficient reserve storage irrigation system in districts with rainfalls that are periodically good, can be trusted to alleviate distress: but that without it they tend to aggravate it.

21. The case of Ekrook tank is one in which surplus storage has (though unintentionally) been provided: for along the Adela river, only a small proportion of the available run-off is asked for in ordinary years, while in bad years, when the consumption is great the tank does not refill, but depends on the reserve storage which then becomes of inestimable value, not only for crops and drinking water, but by the maintenance of wells which probably owe their efficiency to percolation from Ekrook tank and its canals. If, then, tanks can be provided in any district subject to occasional drought, they should be designed to hold at least double the water that would be provided by present rules. In short, the provision of reserve storage appears to be the solution of the problem, as regards system No. 1, with reference to the present inquiry; for, as indicated in appendix No. 3, such extra storage would be constructed by available relief labour, and it is better to convert even good lands into reserve lakes with fringes of pasture, etc., that will preserve life in future droughts, than blindly to devote these sites to remain as nurseries for excess population that must migrate, or starve, when the periodic failures of rain recur. But there are many basins with inferior soils that could be dammed up and be utilized for reserve storage; and these basins are situated well inland, where the worst effects of droughts occur and where percolation into wells and any effect towards establishment of rain currents would be invaluable. On the other hand, there are still a few sites for reservoirs in the Western Ghats unutilized. These would, of course, fill yearly and be very useful to the tracts they command; but being of masonry, they would be far more expensive and would not supply so suitable labour for relief gangs as the earthwork dams advocated above in the centre of famine districts; nor would an increase of rain, if induced by ghat reservoirs, be an advantage, but would leave less to fall further East; nor would percolation from them tend to feed the springs of wells.

22. With reference to system No. 4, the chief points to be noted seem to be:—

1st.—That although greatly desired yet these innovations at present do often as much harm as good.

2nd.—That apparently slight re-arrangements of the conditions in each case can secure more general benefits; but to effect this, systematic direction and co-operation of all parties is required.

While it is difficult to give general rules for these irrigation works, it may be noted that in each district the rayats know pretty well what is wanted, but a few interested parties obstruct operations, or will not pay their proper share of expenditure; whereas if they were designed and laid out beforehand, these works would afford excellent labour for relief gangs in time of drought and the cost need then not bear unduly on any one. It may probably be the simplest way, to quote an actual case, where professional advice was called in to draw up such a scheme. See appendix No. 4.

23. The rise of sudden floods in Gujarat and parts of Kathiawar with apparently less rainfall, than would cause a similar run-off in other districts, is due partly to the smallness of the general slope, but probably also to some conditions of absorption that are not clearly understood, and it seems likely that the sinking of wells, or otherwise providing inlets for water and outlets for air, might mitigate these floods and tend to retain for use in the sub-soils, much of the water that now passes away in floods; but it would be necessary, then to pass off by channels the brackish water that would at first be found. At present there is little or no circulation of this kind, and wells are not the assistance they might be in times of drought.

24. Next to water itself silt is the most important feature in irrigation projects, and constitutes the greatest difficulty in the way of their continued success. It goes without saying that the rate of annual deposition of silt in a reservoir is the measure of its life and that therefore as little silt as possible should be allowed to settle yearly in a reservoir; and as the first annual floods bring down the greatest quantity, it may be set down that every tank intended for irrigation purposes should have a catchment area so large, that these first floods may be safely allowed to pass out through under-sluices; but this water should be held up by a weir below the bund, and to such a depth that the silt may divide itself into clayey soil in suspension and sand and pebbles in motion along, or near the bottom and passing away through

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openings there, while the upper and clayey water should be turned into canals filled to over-flowing and distributing the fertilizing matter on the fields, or into numerous field tanks, as described for system No. 5. It has been objected that if this system be adopted there may occasionally be a failure of the monsoon after these first silty floods have been thus dealt with; but if large reserve reservoirs be constructed with comparatively small catchment areas on tributary branches, and if these be kept constantly full, the danger just referred to will be greatly reduced; for if the lower tank be not replenished by the end of the rains, water can be let down from the reserve tank. That the upper tank will in time silt up, must be conceded; but as its catchment may be small and its capacity so large, that it may take two or three seasons to fill it, the annual depth of deposition will be small and therefore its duration so great, that it may be fairly expected some remedy to this silting difficulty will be discovered before the reserve tank's utility is seriously impaired. The construction of terraces for catching silt along the sides of the gathering area, for instance, or the creation of an alternative reserve on some other feeder, whose catchment basin has been already terraced, may be considered.

25. The necessity for holding back water for use in scanty years and specially by the construction of innumerable puddled trenches across the beds of nullahs in system No. 5 may seem opposed to accepted ideas about drainage, but it is probable that in some parts of the country drainage has been carried to excess and that a failure of wells has resulted. If a foot or so of top soil be kept fairly dry, and if a better circulation of sub-soil water is kept up by an extended draft on wells, it is probable that the country will not be rendered unhealthy by a general holding up in every possible way, the water that is now not only allowed to run to waste, but encouraged to do so. Modern researches seem to show that malaria does not come up out of wet ground, as formerly believed, and, if this be correct, a great difficulty in the way of increasing the amount of water available under ground, for use in years of scanty fall, has been removed.

26. While it has been noted that at times of scarcity there will be labour available (and that must be paid) for the construction of protective works, yet it cannot be doubted that, looking at it in only a money point of view, as much as possible should be done before such times come again, as have lately witnessed the destruction of many lakhs of cattle, worth from 100 to 200 rupees a pair, as well as an enormous loss of revenue, especially in the native states of this Presidency. These have inaugurated numerous irrigation projects with great zeal, and these are still in progress in Baroda and elsewhere. The loss of revenue due to the past years of scarcity prevents the active prosecution of such works in some parts, but it appears unwise to learn the cost of droughts and then to wait for further losses before adopting every sort of irrigation that can be proved to be sound and feasible.

27. In conclusion any long respite, that occurs may well be employed to test on a practical scale such of the numerous suggestions, as will have been put before the Indian Irrigation Commission from every direction and that may be deemed worthy of trial. Also, it may possibly be proved, one way or the other, whether wet cultivation and forests and large surfaces of water do tend to produce an improved rain habit; but at all events, it should be seen before the next series of famine years is due, whether irrigation on an extended scale may be trusted to protect India from their ravages. So that, if not, the people may be warned in ample time not to multiply as heretofore in a fool's paradise, but assisted to emigrate to where periodical failures do not occur and where their labour will never be subject to payment at relief rates.

APPENDIX 2.

Suggestions regarding the utilisation of the flow in Rivers in Cutch during the monsoon, sent to the Cutch Durbar, 9th February 1901.

If I am not mistaken, there is a great amount of fairly good, though sandy and light, soil in the territory of His Highness the Rao Sahib of Cutch, which frequently lies fallow, or yields a meagre crop, because the full and seasonable rains have not been received. Also it appears that there is seldom so much rain, that a few extra waterings or even extra soakings (instead of mere sprinklings due to natural showers) would do damage, such as similar treatment has been found to cause in parts of Gujarat and the Deccan where the average rainfall is more copious and where the soil is black and heavy.

2. If this be the case, the construction of comparatively small storage reservoirs or regulating basins, as they might

be called, from which canals might water the fields, whenever there was a freshet in the river, would be of great use. The bund, or weir, being merely high enough to store sufficient water to spread the supply over two or three days. If the people would make small tanks in good positions at a little distance from the river, that could be filled, one after the other, from the main bund and its canal, they could let the water out of these on to their crops subsequently and as required. These bunds might be replenished at every fall and used to complete the waterings commenced by the rain on their adjacent fields. In some places larger reservoirs with high dams could be constructed, that would yield a supply for the cold weather; but these would be far more expensive and difficult to construct and would generally be placed well up in the hills; while the weirs and small bunds referred to above, might be built all along banks of the river below the site of the reservoir. The weirs would be useful in distributing by canals on each bank not only the freshets but also the natural *rabi* flow in the river and the supplies that would be let down from the upper reservoirs or regulating basins. If these basins be constructed the chances of insufficient watering for the monsoon crops would vanish, and the average yield would be greatly increased.

3. Unless weirs in Cutch rivers are to be utilized for monsoon waterings, as well as for *rabi* crops, it does not appear that the natural flow in any of these rivers during the dry weather, will, when led out of the rivers by means of weirs with suitable head works and canals, pay a fair return on the outlay that would be incurred in building the weirs and forming the canals and looking after the irrigation.

4. For instance, taking the case of the broken weir on the Pur river, the length of it is about 320 feet; its average height 25 feet and its mean thickness 6 feet, the mean cross section having an area of 400 square feet; taking the cost of the work at 25 rupees per 100 cubic feet, the price would be 100 rupees per foot forward of the weir; or for 320 feet, Rs. 32,000. The canal and head works would cost probably Rs. 5,000, more; say at least Rs. 37,000: this at 4 per cent. would cost Rs. 1,480 for interest per annum but this is only a first rough approximation to show that, the *rabi* flow alone won't pay the cost. Foundations and undersluicing arrangements will be expensive and must be carefully estimated. The design of the present broken weir is very faulty in every feature and must be removed, if this site be adopted for a new weir. (A sketch design and estimate is appended.)*

5. Now the water measured on the 29th January 1901 shows a supply of six cubic feet per second; at least $\frac{1}{3}$ rd would be lost; leaving, say, four cubic feet; or only sufficient to water about 400 acres of dry crops. Now the rates for these would not be more than Rs. 1,200, leaving a deficit of Rs. 280 for interest alone, but there will be cost of maintenance; but if the canals were also to be utilized for monsoon water, it would show probably a very considerable net revenue, as the site commands a considerable strip of good land on the bright bank.

6. If a storage reservoir or even what may be termed moderating basins can be formed on this river higher up, this weir will prove still more valuable; or on the other hand it may be found that the land can be commanded by a shorter and cheaper weir higher up.

7. From inspection of the ground where the Pur river cuts through the rocky ridges at the villages of Radhanpur and Traiya, it seems probable some storage work can be economically formed, and escapes for the surplus water provided at the flanks of the ridges. The catchment area at this site is about 34 square miles. But before final opinions can be given as to the best locations for the several structures that are possible on this river, complete surveys must be made as well as trial pits sunk to test the soundness of the foundations and decide the depths to which they must be laid. The rocks appear to be in rather thin layers with somewhat porous materials between these. So that great, deep and wide foundations laid in the best hydraulic lime must be specified, while the junctions of the walls with the banks must be effected with long wing walls united to the rock by concrete filling well rammed in. Cushions of water as they are called on which the floods passing over weirs may have their force broken, must be formed by building subsidiary walls at a little distance below the main ones. Otherwise the bed of the river will be eroded and the safety of the works endangered. Nothing but well-designed and carefully-built weirs will stand on the Pur. A drawing for the new weir and specifications will be sent shortly to show the sort of work that is necessary; but it is probable that a narrower part of the river can be utilized which will

* Not printed.

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APPENDIX 3.

Extract of a Report made at the request of the Darbar of the Palanpur State.

2. On the Kapra river two sites for large earthen dams were found, one below and the other above the village of Hathidra.

3. Commencing with the lower site, this is situated $\frac{1}{4}$ th of a mile up the gorge, whence the Kapra issues from the Hathidra Valley. It is where a low hill faces the mountain on the opposite (right) bank of the river, while the Hathidra road passes between it and the ridge that rises thence to the hills on the left bank. It will be seen from the section that the main gap, which has to be bridged, lies between that low hill and the opposite mountain. It is to be 1,400 feet long, top width 20; the ground rises rapidly, on both sides from the river: front slope 3 to 1, back 2 to 1.

4. There is good stiff clay soil along the section, where trial pits have been sunk, and there is an abundance of suitable materials for construction of the dam in every direction. Good (brick) clay is procurable for the puddle trench and core. Water is plentiful even now on and below the surface of the river for use on the works, and for the people to drink, and there is abundance of stone for face work on the adjacent hills, and there are said to be lime quarries in the valley.

5. It is proposed to raise this bund to three feet over the top of the hill, mentioned above, which is 77 feet above the river bed. This will suffice to impound a depth of 78 feet of water (a natural waste weir, described below fixed this depth.) The gap at the road and another a little further to the left will also be closed eventually, but will form very convenient outlets for the water, if it should be necessary to stop the work during the monsoon. The regulating tower and outlet culvert will be placed on this road, or it may be found preferable to bore a tunnel through the low hill itself. In every way the site is a most convenient one for constructional reasons. It remains to describe the proposed lake and the conditions of its replenishment.

6. Its area, or water spread, when full, has been approximately estimated at four square miles, at least. The valley is wide and flat, but the enclosing hills are steep and rocky. The slope of the river bed is 17 feet per mile. The mean depth of the reservoir is estimated at 22 feet and its contents at two thousand five hundred millions (2,500,000,000) cubic feet. The catchment area is only 15 square miles: so that this design would not be suited for the requirements of an ordinary irrigation work; but it is very suitable for a protective work to be utilized chiefly in years of drought. The catchment area being so small compared with the contents of the lake, it will probably take several years to fill it; but when filled, the annual replenishment would be lost over the waste weir if not utilized for irrigation. A quantity therefore equal to this may be drawn off for that purpose annually leaving the rest for famine reserve.

7. The rainfall at Hathidra has been estimated by the Chief Minister of Palanpur at 45," as the average for the six years ending with 1898-99 * * * * *

9. * * * * * It will be seen from the foregoing, that 690,000,000 cubic feet of water will be available for irrigation at the end of each ordinary monsoon. This quantity will suffice to irrigate 6,900 acres of ordinary cold weather crops, for which a revenue of Rs. 27,600 may be expected. But when this has been expended the annual loss by evaporation has occurred in the lake without monsoon replenishment (i.e., when the monsoon has failed) there will remain still 1,500,000,000 cubic feet in the lake, which can be utilized for irrigating 15,000 acres of land, the value of which in such a year cannot be estimated.

APPENDIX 4.

Notes regarding Limbdi rivers and lands lying at the north-east of Kathiawar.

1. The chief source of prosperity and fertility in these districts consists in the annual silt bearing floods; supplemented by local rains; the latter is, of course, essential

at such high-lying parts as cannot be reached by the annual floods.

2. These floods appear to pass over most of the country with a depth of from 2 to 3 feet. In the main nallahs the depth is greater at flood time, but generally only from 2 to 3 feet; these nallahs are wide, shallow and very sandy.

3. The sub soil consists apparently everywhere of sand, probably sea sand; on this a stratum of alluvial soil consisting of sand and clay and vegetable detritus has been deposited through a long series of years. This layer of soil is in a state of unstable equilibrium. It is very easily dissolved and carried away; the floods bring it and if a higher more rapid current passes over any place the soil is washed away.

4. The soil consists in most places of equal parts of sand and clay; but in some places there are three parts of sand to two parts of clay; and in very poor fields the proportion is even three parts of sand to one of clay. The great object should be to retain the clay and vegetable mould and to keep the sand covered up and undisturbed.

5. The sand appears to contain salt; and this salt is forced upwards in many places by water from below apparently which brings the salt to the surface and renders the land barren; one of the objects held in view is to prevent such upward percolation or to wash away the salt if ever it has been brought to the surface. It appears that this can be managed.

6. To sum up the chief objects to be attained are —

- (a) To prevent land being cut up and washed away.
- (b) To utilize and preserve silt (clay) as much as possible and to increase the proportion of it to that of sand.
- (c) To cover up and get rid of as much sand as possible.
- (d) To prevent upward percolation of water and salt efflorescence from appearing on the fields.
- (e) To wash this away when it does come.
- (f) To store as much water as possible in suitable tanks and use it for washing salt land and for rice cultivation.

7. In order to carry out these, systematic treatment of the district is desirable so that when good is done to one part injury may not result to another part. Care must be taken not to overdo improvements. By working all the arrangements systematically, double and treble benefits will be derived; for instance, if the rapid passage of floods over certain fields be restrained by a number of low parallel banks and so as to hold up the flood for a short time, the silt will be deposited on the fields and erosion prevented, but also the clear water should then be led into suitable tanks provided at convenient sites, so that these shall be filled with clear water instead of dirty flood water, which soon chokes up the tank with silt. The clear water will then be used to wash salt land.

8. Again if cuts are made to draw off excessive floods from one district care must be taken that the water is not discharged on to lands already affected with floods. It has been noticed that in some cases this is done and that water coming from a flank, in addition to the former flow across the field, causes the soil to be cut up and destroyed. This appears to be the causes of vast injury at Jambu—a new cut is wanted to carry off water that flows from Sani towards Jambu and the extra water in the main river should be prevented by a dam from entering the cut up land.

9. If system be organized and an efficient establishment, works will easily be carried out so as to assist each other. Cultivation is allowed in the beds of large nallahs as at Pansina, but though it is a good thing to utilize sub-soil water for melons, the banks should not be allowed to be constructed across the river bed but parallel to the stream, then obstruction would not be caused in floods.

10. When sand is dug out of a cut or channel it should all be deposited where a bank is required for a tank or other work and should be covered up with clay. It is thus got rid of and does good, instead of harm.

11. Details of the several channels and works proposed and methods of constructing tanks, waste weirs and outlets will be given hereafter when levels have been taken.

1. Q. (The President.)—You have had many years' experience in the Irrigation Department of the Presidency, and latterly you were Chief Engineer?—Yes.

2. Q. You designed and carried out the Nira Canal, did you not?—I did.

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3. Q. We should be glad to get the benefit of your experience. We are much obliged to you for the interesting memorandum you have kindly sent in. In the first place you call attention to *bandharas* or field tanks. What size do you contemplate building these tanks?—According to the size of the fields; and I would build them in such a way that if the field-owners wished to enlarge them, they could do so. Several men might club together and make a tank for themselves. In the north-west corner of Sind, just above Karachi, there are a large number of tanks; people club together and gather into these tanks the water that comes down the nallah. There is a very large tract in Sind which is fertilized from such tanks.

4. Q. These tanks would irrigate four or five acres each?—Yes, I think so.

5. Q. They would not be called upon to hold water for more than a few weeks at a time?—They would give water as soon as the rain had done its work. They would store a supply for two or three weeks.

6. Q. Now you say that you would have a system of irrigation "from a series of weirs along torrents and steep tributary streams." You would have the tanks filled from streams that flow one hundred miles away?—Yes.

7. Q. Then you say that "the narrow nallahs suitable for these works have too steep beds to form storage tanks. Would you not extend these *bandharas* to rather larger streams?—Yes, they could be extended to the larger streams; but the great majority of them would be from the smaller streams, so that the villagers could manage them themselves.

8. Q. Would you propose that the *bandharas* should hold up to 3 or 4 feet of water?—I don't think any storage is possible in the nallah itself, as the velocity of the water is so great that the bund will be carried away at once.

9. Q. Is the system carried out anywhere in the Deccan?—I have seen small tanks of this description in the Poona District, near Purandhar, and in the hills near the Nira. The purpose is to catch the silt, of which they get a nice deposit from the hills. It is a kind of terracing. There is a great deal of it in Purandhar. In every nallah they do it, to catch the silt, brought down by the stream, which is very fertilising.

10. Q. Have you ever tried your automatic system of distribution?—This automatic distribution was proposed by me in a dispute between a Native State and some villagers. It was found to work well.

11. Q. Generally speaking, is the silt in the Deccan of a very fertilising nature?—Yes; in connection with the Poona water supply, I suggested that silt beds should be made, so that in the dry weather, when the water got clear, the silt could be put aside and in the monsoon it could be utilized, instead of being carried away. It should be put back in the monsoon in order to keep the water free from weeds. In the Nira the water is dark with silt all the way down and there is very little trouble with weeds.

12. Q. We have been told by various witnesses as to the possibility of storage tanks in the rainy zone of the Western Ghats. We have learned of two sites above Lake Fife, and one above Bhatgarh in the Nira Valley. Perhaps you can tell us of more?—On the Nira at Bhatgarh, two reservoirs might be made on the Gelavandi and Ganjawin. And there is another site above Bhore.

13. Q. Have they been inspected?—The one on the Gunjawin was very carefully surveyed. I had the plans made in detail.

[Mr. Beale explained that these surveys and plans could not be found. He had found some; but they only referred to the survey of the right bank.]

14. Q. (Mr. Ibbetson.)—I think that all irrigation projects should be printed. We have heard of many such cases as this, in which plans have been lost after the expenditure of much time and money?—Mr. Berman did that survey, and the maps were most beautifully traced. He did both banks.

15. Q. To go further down, are there any sites for ghat reservoirs in Satara?—In Satara there are several sites near the railway. These are east of the line. Messrs. George and MacLaren surveyed them last year.

16. Q. Further north than that?—There was the Karla project on the Krishna; but I believe that has been rejected.

17. Q. Are there any sites in Kolhapur?—I do not know.

18. Q. You probably know about the Maladevi and Chankarpur tanks?—No; but there is a site at Raipur,

which has a catchment area of 800 square miles. It is a good site, and there are two sites above it. I would store water in pockets outside the ghats keeping it, if necessary, for five or six years so as to have it available for a famine year.

19. Q. We find that a certain distinction has been drawn in the Deccan between protective and productive works. The Mutha is a productive work, and the Nira, a protective work. Is there any advantage in keeping up this distinction?—I think that you might treat the supply up to a certain point as productive, and beyond that as protective, to be utilised only in very dry years. If a work is expected to pay its interest on capital account, it should be worked as a productive work, otherwise as a protective work. In Gujarat and Palanpur, they regretted very much not having adopted this principle, as several lakhs of cattle, worth Rs. 200 and Rs. 300 a pair, were lost for want of fodder. If a little water had been stored the cattle could have been saved.

20. Q. Would you put any restriction on the *rayats* growing a certain kind of crop, or would you leave it to them to learn by experience to do their own distribution?—As long as you can be certain of giving the water, I do not think that restriction is necessary.

21. Q. Would there not be a tendency to grow too much sugar-cane. On the Mutha we hear that they can command one hundred to one hundred and fifty rupees per acre of cane; and that, in consequence, they grow as much as possible. Would there not be that danger here?—They should be told that they may expect a certain amount of water; and that they must arrange accordingly.

22. Q. We have had a proposition lately that no water should be given for cane after a certain date, unless there is water to spare. Do you agree with that?—They might be given water on condition that they should continue the irrigation by wells.

23. Q. Would you make the charge smaller on account of this liability?—Yes.

24. Q. We have had a good deal of discussion on the subject of applications for water. Are they a necessity in your opinion?—I should like to give the water to a village and let the people distribute it among themselves. At Vir there is a river with a nice supply, and here the people divide the water by a *panchayat* and they never have any quarrels.

25. Q. From what you saw at Vir, do you think that it would be possible to apportion the water by regulating the size of the outlet according to the area to be irrigated?—The people would tamper with the outlet. The water should be let into channels, and they should be allowed to take it.

26. Q. Do you think that we could make an outlet that they could not tamper with?—Yes, but where you have a *patkari* there is always favouritism. It would be better to put the water into a tank and leave it to the villagers to distribute.

27. Q. (Mr. Higham.)—With regard to sites for large reservoirs fed by rainfall from streams and rivers have you mentioned all that occurred to you as feasible schemes?—I had no time to mention all the sites when preparing my note.

28. Q. Then you have examined sites for other tanks?—Yes, I examined the Gerha site at Wadaj, south of the Nira Canal. That is a very good site, a weir could be made there. It is an inland pocket, which could be fed by the irrigation canal.

29. Q. Would that be an unfailing supply?—In very bad years, it might fail; it is in the Ghats where there is a rainfall of 21.85 inches; it would fill in three years out of five.

30. Q. I was thinking of sites that might be depended on annually. Have you seen the Maladevi Tank?—I have not seen it.

31. Q. Are any storage tanks possible on the Godavari?—There is a site at Rahuri in the Ahmednagar District. It is on the Mulla River. It has 800 square miles of catchment. There is some difficulty about the waste weir, but it is a splendid site.

32. Q. (The President.)—We have been told of another one near Poona on the Koina. And there are proposals, we are told, to make a storage tank in connection with the Godavari at Nasik. Do you know anything of these?—No.

33. Q. (Mr. Higham.)—Do you know of any other sites?—There is a site at the junction of the Mulla, and

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another above the Khadakwasla Lake. I examined a site near Bhusaval at a place called Raipur for a tank on the Waghar.

34. Q. Would it fill?—It is in a very large catchment area; and there is more water than is wanted. The greater part of the water would run to waste. It requires a large waste weir.

35. Q. If you have a large tank, you must have a comparatively large area at your command?—If you use it as a protective work, a minimum supply of the storage can be used, and the rest kept for use in bad years.

36. Q. Do you know of any tank in which a portion of the supply is kept from one year to another?—No, I think you lose nothing by keeping the water. I would make tanks larger than would be filled every year, in order that when you have deficient rainfall the Executive Engineer may have water for the people, who will be disappointed if they do not get water regularly. If they are given water one year and refused the next, the people lose confidence and won't take water at all.

37. Q. Then you recommend two-year tanks?—Yes, I believe in large reservoirs. In ordinary years, the crop would be guaranteed, and there would be a supply for fodder for the cattle. I proposed that a second tank above the Mhaswad height be constructed, so that the water in the lower tank should be supplemented, and the supply guaranteed.

38. Q. Does Mr. Beale know about that tank?—(Mr. Beale).—There was a proposal for a tank above the Mhaswad which has been rejected.

39. Q. Would you never irrigate from the upper tank?—No, I would store it simply to give confidence to the people who irrigate from the lower tank. Some discouragement has been caused, owing to the supply of the Mhaswad tank having sometimes failed.

40. Q. As regards your system of *bandharas*, you refer to a series of weirs from streams that come down spasmodically for a day or two?—Yes, I refer to streams that come down in short spurts; they have steep slopes.

41. Q. What would you call steep?—About 17 feet a mile.

42. Q. You do not think it would be good for storage, if it was more than 5 or 6 feet per mile?—Nallahs of steep fall are not good for storage tanks—6 or 7 feet per mile is the limit.

43. Q. Without a steep slope, could not you get a good command?—The *bandharas* I speak of are those in which the watershed is quite close. I would have a *bandhara* and then five or six tanks; then another *bandhara*, and so on.

44. Q. Are there any such works?—No, not in these Provinces, but in Sind they use that system for getting the water on to their fields.

45. Q. Is there not a great difference between the requirements of water in the Deccan and in Sind, where one watering will suffice?—Yes.

46. Q. When do the basins fill in Sind?—The basins in Sind fill during the flood in the south-west monsoon, when water comes down from the Baluchistan hills; it is not then wanted owing to rain.

47. Q. What is your idea of the size that these basins should be?—The basins should be large enough to give two or three waterings. If possible, they should be in two or three different parts of the farm.

48. Q. Are there suitable sites in every farm to build two or three of these tanks?—Yes when one is silted up wheat can be grown on it and another used for storage.

49. Q. Is the country in this part of India as feasible for storage as that in Sind?—I have seen them in Purnandhar, but, perhaps, the idea of two or three persons combining would be new to the people in this part of the country.

50. Q. You would not make any large tanks to be fed from the nallahs?—In Cutch, near Bhuj, there are places where weirs are made 30 feet high; but the people do not make them now.

51. Q. What would be the cost of bringing down enough water to carry the crops through the cold weather?—I don't think that the water will last beyond the monsoon—not generally for the *rabi* crop.

52. Q. Do you contemplate Government building tanks of its own, in addition to the village distribution tanks?—I don't think it will pay.

53. Q. You would pass the whole of the supply into little basins?—Yes, the weirs will have to be made very carefully.

54. Q. Would there be any danger of silt accumulating above the weir?—Yes; but the greater part of the silt will be good. There is not much sand in these nallahs.

55. Q. Would you recommend weirs with gates; would that be an advantage; or would it be an unnecessary expense?—Falling gates would be good, but would be an unnecessary expense on small works. But sluices with wooden needles could be used.

56. Q. In the case of farms or villages, where it is not possible to find sites for storage, would you have the water directed into water-courses?—Yes.

57. Q. But you don't think that all the fields will benefit equally?—Many fields could be served in this manner.

58. Q. That would be where the slopes are steep, more or less on the hills. Do they get famine there?—No, not on hilly lands like Baroda.

59. Q. In what district do you contemplate these *bandharas*?—In the Districts of Satara and Poona, in the Nira Valley.

60. Q. That District is not at all subject to famine?—No, I only name it as a case. In Sholapur and Bijapur the people would have prior claim to the submontane tracts.

61. Q. (Mr. Ibbetson).—Would that system be possible in Sholapur and Bijapur?—Yes, I think it could be done, and where the slope is steep, the storage could be obtained in the nallahs.

62. Q. (Mr. Higham).—I understood that you propose the extension of this system even to a canal like the Nira, i.e., to allow each village to have a tank and to fill it and distribute the water among themselves?—I think the Nira Canal water might be distributed in that manner.

63. Q. Practically you would charge on the number of times the tank is filled?—Yes; you would have to be a little lenient at first, it would save the cost of measurers and other expenses.

64. Q. Surely it will be difficult to find sites in that flat country. Do you suppose you could get sites for two or three tanks in each village?—I think there are a great many tank sites to be found. There are tanks in almost every village. In Madras they have thousands of small tanks.

65. Q. Where you could not get tanks, you would still have to keep the *patkari*?—Yes.

66. Q. There you could not adopt the system as a whole?—No.

67. Q. Then tanks seem to me to be open to three objections: (1) You cannot find sites; (2) they would be expensive; and (3) they are likely to silt up, and new ones would have to be made?—The clearance of the silt of these tanks could be done by famine labour.

68. Q. Suppose there was no famine. There would also be loss by absorption?—The loss by absorption would go into the wells.

69. Q. Do you contemplate that these tanks should be made by Government or by the people themselves?—By the people themselves.

70. Q. (Mr. Rajaratna Mdlr).—Where water is not available for tanks, could their place not be taken by outlets and the people allowed to open and shut them themselves?—Yes, I think that could be done.

71. Q. They could be opened by *patkaris* on particular days?—Yes. I think that could be done.

72. Q. (The President).—We would be glad to have your advice as regards Kathiawar?—I would like to put in these additional Memoranda which I have prepared in regard to works in Kathiawar.*

73. Q. Have you had any experience of famine labours?—Yes.

74. Q. Could it be usefully employed on these *bandharas*?—Such labour can be employed on the earth-work.

75. Q. The bunds would have to be of masonry?—The bunds would be of earth and pitched; and where the water flows over, there will be longer vertical stores. I have made such an escape successfully.

76. Q. (Mr. Muir-Mackenzie).—The Nira Canal I managed as a protective work, i.e., the water is conserved for *rabi* crops. On the Mutha, which is a productive work, all the water asked for is given for perennial irrigation? Do

you not think that one system of administration would do ? Don't you think we could manage works like the Nira on the productive principle and give water freely for perennial crops if asked to do so ?—No, there should always be a reserve.

77. Q. Was it at your instance that the Nira was managed as a protective work ?—I think that it was done at my suggestion.

78. Q. Are you satisfied that the results have shown the necessity for it ?—I am very much in favour of storage for famine years.

79. Q. You say you are strongly in favour of extra storage in view of famine. Do you mean you would provide storage in excess of the demand, or that having the demand, you would still refuse water with a view to storing it for a famine year ?—I would take the minimum average and guarantee water for that amount always. The remainder I should keep as a reserve.

The President.—We are greatly obliged to you, Mr. Whiting, for the trouble you have taken in preparing your note and for coming here to give evidence.

Mr. J. E. Whiting.
10 Jan. 02.

THIRTY-FIRST DAY.

Dharwar, 13th January 1902.

WITNESS No. 82.—MR. H. R. SHIRHATTI, Pensioned Deputy Collector.

Memorandum by Witness.

As far as I know, the chief irrigation works in the Dharwar district are:—

- (1) The Madag Tank in the Kod taluka;
- (2) The Asundi Tank in the Ranebennur taluka;
- (3) The Medleri Tank in the said taluka.
- (4) The Dambal Tank in the Mundargi Petha of the Gadag taluka.

With regard to the first three tanks I am unable to give any elaborate description as I have had very little time at my disposal to make inquiries about the details concerning those tanks, but I can only say now that those tanks, especially the one at Madag, have been the source of great help in irrigating a vast area of lands which yield different kinds of crops, viz., sugarcane, lemons, plantains, coconuts, vegetables, etc. It is the greatest tank in this district; but I dare say that no tank of such extent and usefulness exists anywhere in the adjacent parts of the country except in the adjoining Mysore Province. Indeed, this tank, irrigating as it does a large tract of land, holds a great check upon the effects of famine, and, if I mistake not, famine does scarcely assume a fearful aspect in the Kod and the other adjoining talukas, as compared with the talukas and districts lying at a distance. I know something of the Medleri and Asundi Tanks, because I have served in the Ranebennur taluka as mamlatdar there. Both these tanks, though not so extensively irrigating as the Madag Tank, do water a considerable acreage of land and yield crops such as those mentioned for the Madag Tank, though to a smaller extent. These tanks do not yield sugarcane on a large scale, but produce plantains, lemons, sweet potatoes, etc., and are therefore of very great use to the people. But I respectfully beg to propose that the irrigation rates may be reduced, as they are higher than the rates at such tanks as Madag and Dambal.

There are a few irrigating wells throughout the district of Dharwar. I may mention one or two such wells in the Mundargi Petha of this district, where I at present live, viz., the wells at Tambargundi and Ramenahalli in the said petha. These afford some relief to the ravats, who, by producing plantains, vegetables, and other minor crops, can drag on in times of scarcity without being obliged to go to the famine relief works to obtain subsistence.

I can also mention that from the channels of the big nalla, which takes its course near the village of Jentli and which runs by the villages of Meundi Tambargundi, Mundargi, Shirol, Byalawadgi, Bennehalli, and Rati in the Mundargi Petha, many garden lands are watered, yielding sundry crops such as paddy and those mentioned above and also coconuts. A special water-rate (not irrigational) is realized for the use of such water by the Revenue authorities. I know for certain that these channels help the owners of the lands concerned a great deal. One of such land-owners is my son-in-law, who is a big land proprietor in this district. He obtains different kinds of crops, paddy, sugarcane, etc., and I humbly submit that other people wishing to have the use of this nalla, which is a very big one and capable of supplying ample water, may

be allowed to utilize the water thereof for irrigational purposes on payment of a small water-rate. If this thing be done, there is no doubt that the effects of famine, when it may unfortunately occur, will be less felt by a certain portion of the people at least, as they can with a little trouble grow grain and vegetables for themselves and for other people and wet jowari fodder for their cattle. This jowari, "neer jola" as it is called in Kanarese, is grown in fields having wells by a few people in this petha as well as elsewhere to supply fodder to the cattle when there is scarcity of ordinary kadbi for them.

I am glad to say that I am in a position to give rather a detailed description of the Dambal Irrigation Tank. This tank lies in two Revision Survey Nos., viz.:—

	Acres.	Gunthas.
402	505	34
894 . . . . .	...	10
2	506	4*
* Bed of the tank . . .	436	...
Area of feed channel . .	70	4
	506	4

Before the famine of 1876-77 the area of this tank was 300 acres. It was extended by 136 acres in that year.

In ordinary years, when the tank is completely filled it irrigates 580 acres of land. In ordinary years, when the tank is full it holds 114,182 millions of cubic feet of water. In times of drought it almost gets dry and cannot irrigate any portion of the lands, but it is usual for the Irrigation Department to sell grass by auction for the year and also to rent out the bed of the tank for the cultivation of horse gram and other minor crops at fluctuating rates. This course is certainly beneficial both to Government and the people, and I humbly recommend that such cultivation may be more liberally encouraged by Government in times of drought.

The lands on which the consolidated rate is fixed measure 143 acres 29 gunthas, and the area on which no rate is permanently fixed but on which assessment is realized from year to year is about 110 acres.

The amount of money expended on the repairs of this tank annually is about (Rs. 140) one hundred and forty. All kinds of repairs to this tank are carried out by the Irrigation Department, the village people not having to do anything in connection therewith. The distribution of water is controlled by the officers of the Irrigation Department, and a gauge clerk on a small pay is posted at Dambal to look after the tank and to manage the distribution of water.

The following crops are grown by the water of this tank:—(1) barley, (2) jowari, (3) beans, (4) sugarcane, (5) paddy, (6) vegetables, (7) fruits such as guava, plums, plantains, jambuols, lemons, (8) mawca, (9) navani, (10) bajri, (11) tobacco, (12) onions, (13) chillies, (14) methi, (15) garlic, (16) flowers, etc. Of these, sugarcane, guava,

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lemon, plantain, and flower trees receive water for twelve months and are watered once in ten days. Brinjal and chilly plants receive water for eight months and are required to be watered once in eight days. Paddy, methi, onions, garlic, tobacco, and vegetables receive water for four months at the intervals of seven days; till (sesamum), jowari, navani, wheat, horse gram require to be irrigated once or twice during the year.

The amounts of irrigation rate realized over the lands irrigated are Rs. 10 per acre at the Madag and Dambal Tanks and as high as Rs. 14 for those at Medleri and Asundi. It is understood that there is a proposal by the Irrigation Department for the increase of these rates and I dare say that it is not in my humble opinion advisable to augment the present rates which are already high. I say so because a great deal of money is required to be spent by the cultivator on the lands before he gets the crops home. In addition to the irrigation rates named above the cultivator has to pay an ordinary assessment of one rupee per acre of land as assessed by the Survey Department. Now I shall give some details of the money required to be expended by the cultivator on different kinds of crops over an acre of land.

For the sugarcane crops:—

	Rs.	A.	P.
Ploughing	12	0	0
Furrowing	4	0	0
Manure	15	0	0
Seeds 12,000 at Rs. 1-8-0 per 1,000.	18	0	0
Carrying the seeds	1	0	0
Weeding, 100 labourers	6	4	0
Reaping the crops	10	0	0
Water-rate	10	0	0
Ordinary assessment	1	0	0
Watch labourers	40	0	0
For preparing jaggery for 6 days at Rs. 8 a day.	48	0	0
	165	4	0

The yield of the jaggery from sugarcane crops obtained for six days' labour at the rate of 3 "Hers" of 8 maunds each, is 18 "Hers" valued at Rs. 180 at the rate of Rs. 10 a "Her."

	Rs.	A.	P.
	180	0	0
Deduct the expenditure	165	4	0

14 12 0 is the net profit. Not only this, but in some years the net profit is as low as Rs. 4 or 5. This is certainly a very poor gain for a rayat who has been devoting his whole time and the time of some of his family members for a greater part of the year.

For guava, lemons, etc.:—

	Rs.
Clearing the land	12
Digging pits	2
Manure	2
Carriage of manure	1
Water-rate	10
Assessment	1
Labour for watching	40
	68

By deducting this sum from Rs. 80 we have a gain of Rs. 12, sometimes less than that.

Now for brinjal, etc.:—

	Rs.	A.	P.
Ploughing	10	0	0
Manure	9	0	0
Digging pits	1	0	0
Furrowing	8	0	0
Weeding	2	8	0
Water-rate	4	0	0
Ordinary assessment	1	0	0
Labour for watching	8	0	0
	43	8	0

The yield comes to Rs. 50. Deduct the expenditure which is Rs. 43-8-0 and the net profit is Rs. 6-8-0, sometimes much less than this.

For methi, garlic, onions, mustard, chillies, and vegetables, etc.:—

	Rs.
Ploughing	5
Seeds	4
Water-rate	2
Ordinary assessment	1
Watching	8
Re-planting	5
	25

Deduct this amount from the yield, viz., Rs. 35, and the net income is Rs. 10 and sometimes less.

The expenditure for the growth of plantains and paddy ranges between that of sugarcane and brinjals.

I believe that this information is sufficient at present for the purpose, and I hope to be able to give more information at the time of my evidence before the Irrigation Commission.

I know not of any remissions of the water-rate being given to the cultivators when the tank fails and their lands remain unirrigated. This, I humbly submit, is not fair. Why the cultivators should pay when they are supplied with no water I cannot understand. The rates are water-rates and need be paid only when water is supplied; and, besides, they have to pay the ordinary fixed assessment for the lands they hold.

The constructors of irrigating wells are often assisted by Government by advances in the shape of tagai. In this respect I am humbly of opinion that some concession should be shown to the constructors of such wells; for instance, the rate of interest be reduced and the periods within which such loans may have to be repaid should be extended. I even go so far that in order to encourage the multiplication of such wells Government should be kind enough to make advances to energetic but certificated poor people without any interest at all for a certain small number of years at least. This course, if adopted, will lead to the numerical enhancement of such useful wells whereby to mitigate the evil effects of a future scarcity or famine. Such works are to my knowledge, never undertaken by District Boards but by private land-owners from their own private funds solely, or being assisted by Government by the grant of advances, or purely from the tagai advances granted to them by Government. It has not been the practice of Government to encourage the construction of such works by loans to District Boards.

The protective value of these works will undoubtedly be increased by devoting more money and greater attention to their up-keep and by encouraging the constructors of new works. Enforcement of local responsibilities in this connection is necessary, and the Taluka Local Boards and the village officers concerned should be held responsible for promptly bringing to the notice of the Collector, through the Mamlatdar or Mahalkawi of their talukas or pethas, as the case may be, as to the necessity of the construction of new wells or repairs to the existing wells or other sources of water-supply which may require immediate attention, both for irrigating purposes and for water supply for men and cattle. This country is well known for scanty supply of drinking water and I have known instances in which men, especially women, have to carry water from a long distance, not to speak of cattle which, though they have plenty of fodder to eat, have to remain satisfied by drinking water once during the whole day. What I beg to propose is that in almost each village where there has been no natural resource of water, such as a river or a running nala or never-drying well, a well should be constructed by the Local Boards with a wooden or stony trough attached thereto for the cattle to drink water at.

In conclusion, I have to make an important suggestion for the construction of a bund over the river Tungabhadra at the village of Korlaballi six miles from Mundargi. This bund was originally constructed, though not completely, by the two brother ministers, viz., Danak and Muddapa, of the now extinct kingdom of Vijayanagar, at present traceable in the ruins of the celebrated holy place of pilgrimage Hampi (the Puranik Kishkinda) in the Bellary district of the Madras Presidency. This bund will, I am afraid, cost a great deal of money and trouble, but, if completed, will be a means of irrigating a vast area of land, such as that done in the Bellary district and in the Mysore province. Best kind of rice, coconuts and other garden produce are grown to a large extent in the above-said provinces by means of canals taken from this river, and much benefit is

derived from it. It will certainly be a great boon conferred upon the people of these parts if the work I have proposed will be carried out at any cost and trouble, and it will undoubtedly be a means of checking the occurrence of famine and will likewise afford plenty of labour for famine-stricken people at a future famine.

I respectfully beg to add another important tank existing at the village of Mugad in the Dharwar taluka, which waters many a paddy field yielding best kind of rice. This

tank is not under the control of the Irrigation Department, and no water-rate is realized by that Department, but a special water-tax is received by the Revenue Department in addition to the ordinary land assessment. This tank is a big one and may be conveniently transferred to the Irrigation Department, if deemed advisable.

I expect to collect fuller information as regards the other irrigation tanks and other works of water-supply by the time I shall have to give my evidence before the Irrigation Commission.

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1. Q. (*The President*).—You are Pensioned Deputy Collector?—Yes.

2. Q. What districts have you served in?—I have served in the districts of Belgaum, Bijapur, Dhairwar, Ahmednagar, Nasik, Khandesh, and Kolaba.

3. Q. You know the district of Dharwar very well?—Yes.

4. Q. What districts were you in during the famine of 1876-77 and 1896?—I was mamlatdar of Bijapur during the 1876-77 famine.

5. Q. And during the last famine?—I had retired before the last famine.

6. Q. You say in your memorandum "the irrigation rates may be reduced as they are higher than the rates of such tanks as Madag and Dambal." You refer, of course, only to the rates for sugarcane?—Yes, the sugarcane rates are Rs. 14 per acre.

7. Q. What are the rates on the Asundi and Medleri tanks?—Rs. 14 for sugarcane, Rs. 5 for 8 month crop. I think Rs. 14 for sugarcane is too high. Under the Dambal tank, the crops are better and the rate is Rs. 10.

8. Q. The rates are not higher than those on other tanks. In Bijapur and Sholapur and other districts, the rate is Rs. 18 per acre?—That is very exorbitant.

9. Q. On the Krishna Canal the rate is Rs. 25 per acre?—The people in this district are very poor, and cannot pay such high rates. They are not prevented from growing sugarcane by the rates now charged?—They grow it because there is no alternative.

10. Q. If, instead of lowering the rates of the Asundi and Medleri tanks Government were to raise the rates of the Dambal tank, would that give satisfaction?—It would, I think, be a great injustice to raise the other tank rates to Rs. 14.

11. Q. You say "there are a very few irrigating wells throughout the district of Dharwar." Why are there not more wells?—Because the people do not get any assistance from Government. Unless Government give *takavi* they cannot sink wells.

12. Q. Are no advances made in this district for wells? Yes; *takavi* is advanced, but the system is defective.

13. Q. What is wrong with it?—If a man wants the advance of Rs. 100, he has to journey two or three times a distance of 30 or 40 miles with the patel and kulkarni, who have to be fed on the way, then the karkuns at the taluka office have to be pleased; and the man may lose as much as Rs. 25 out of the 100.

14. Q. What do you propose as the best means of meeting the case? We all feel that the system should be made as easy and simple as possible?—I would propose that several central towns should be selected, in each of which a pensioned officer, or a respectable private person should be empowered to distribute Government *takavi*. He might be a zemindar. The man should be responsible to the mamlatdar.

15. Q. Would you pay the man anything for the trouble he takes?—No, he should do the work gratuitously.

16. Q. Would he make any restrictions with regard to giving advances to an insolvent man?—He should give advances on the basis of the land owned by the man.

17. Q. But how would this agent find it out?—The man paying the money, would get the information from the mamlatdar.

18. Q. How long does it take a man at present to get an advance to make a well?—He gets it in two or three months; but he wants it in a week.

19. Q. How much does the man get; the whole amount or only a part?—The advance would be a portion of the cost of the well.

20. Q. Who decides how much should be given?—The Collector.

21. Q. You must have given out a great deal of money when you were a mamlatdar?—No, the system was not in force in my time.

22. Q. You say that a man gets a quarter or one-third of the amount necessary for a well: what does he do for the rest?—The rayat may be given half of what he asks: the remainder he has to supply from his own pocket, or he may borrow it from the sowcar.

23. Q. Are there many who go to the Sowcar for the whole amount in preference to the Government?—Since the introduction of the new Land Revenue Act, the sowcars are not inclined to advance much.

24. Q. Suppose the man gets his money, does he complain of the rate of interest?—No, the rate of interest is not high, compared with what the sowcar charges; but the number of instalments should be increased. The instalments are taken too soon.

25. Q. The law allows twenty years?—That may be, but the custom is to allow ten years only. I think the period should be extended to 20 or 25 years.

26. Q. You say "I can also mention that from the channel of the big *nala*, which takes its course from the village of Gentli elsewhere * * Many garden lands are watered, yielding sundry crops, such as paddy and those mentioned above, and also coconuts. * * I know for certain that these channels help the owners of the lands concerned a great deal." Where is the place of which you write situated?—Gentli is in the Gadag taluka.

27. Q. You say that a good deal of irrigation is done from these channels? Who made them?—They were made about 50 years ago by the rayats with Government sanction. They pay a special water-rate.

28. Q. I do not know what you mean by "a special water-rate, not irrigational?"—A rate is levied by the Revenue Department with the ordinary assessment.

29. Q. You say, "other people wishing to have the use of this *nala* * * may be allowed to utilise the water for irrigational purposes or payment of a small water-rate." Who prevent them now?—No non-owners may use the water without the permission of the Collector.

30. Q. Then there are certain land-owners who have a right to the water?—Yes; no others can use the water.

31. Q. You say there is plenty of water there?—Yes, plenty and to spare.

32. Q. Do the people who use it not allow other people to use it?—The Collector has to sanction the use of the water; but in many cases he does not give sanction.

33. Q. (*Mr. Ibbetson*).—Have you ever known the people to apply, and to be refused permission?—Yes; I have known of people applying and being refused sanction.

34. Q. (*Mr. Muir-Mackenzie*).—Do you know on what grounds the sanction was refused, and can you tell us of any particular instances?—No.

35. Q. (*Mr. Rajaratna Malr.*)—Perhaps the owners of private works and the present irrigators prevent others from taking the water?—The channels were built 150 years ago; and I think that the present rayats obstruct the use of it.

36. Q. (*The President*).—You say I have to make an important suggestion for the construction of a bund across the river Tungabhadra. Has that project ever been examined?—I think the matter was referred to the Irrigation Department some years ago; but it was decided as impracticable by the Executive Engineer. I hear that a *bhandara* can be constructed at Hamgi ten miles to west.

37. Q. Do you propose to make a big reservoir there?—Yes, there is a big ruined "bandhara" at Korhalli which also I should like to see reconstructed. The river on one side belongs to Bombay and on the other side to Madras.

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38. Q. You say that you "beg to add another important tank existing at the village of Māṅad." How much does that irrigate?—About one thousand acres. It is situated about seven miles from Dharwar.

39. Q. Is it a second class work?—Yes.

40. Q. (Mr. Higham).—Why do you propose that this tank should be transferred to the Irrigation Department?—Because it is a big work, yielding a large revenue; and would be better managed by the Irrigation Department than by the Revenue Department.

41. Q. What would be the effect of the transfer?—There would be better supervision and better control.

42. Q. What rates do the people pay now?—Rupees 6 per acre.

43. Q. Is that a consolidated rate?—Yes.

44. Q. If the tank is transferred to the Irrigation Department, would the rates be affected?—Yes; perhaps they would raise it.

45. Q. It cannot be increased, if it is a consolidated rate?—The Irrigation Department may increase the water-rate.

46. Q. I do not understand why you want the tank transferred?—Because it would be under better control. At present there are disputes about the distribution of the water.

47. Q. Have you had anything to do with these disputes?—No, I have not.

48. Q. Cannot the people manage the distribution of the water between themselves?—They quarrel about the quantity, and under present circumstances, the matter goes to the Collector, who refers it to the mamlatdar; who sends it on to the Circle Inspector, and great delay occurs. If the tank is under the Irrigation Department, the sub-overseer in charge goes immediately into the matter, which is quickly disposed of.

49. Q. Are there many disputes which have to go before the Collector?—There may be several.

50. Q. In many places the people arrange the distribution among themselves?—They go to the Collector when they cannot settle the disputes among themselves.

51. Q. You have 1,000 acres under irrigation, how many villages are there?—Five or six.

52. Q. Are there disputes between village and village?—No; generally between people of the same village.

53. Q. Are there no disputes between one village and another?—Very seldom.

54. Q. Would the people prefer to have their disputes settled by the Irrigation Department?—Yes; because their disputes would be disposed of with less delay than by the Collector.

55. Q. You speak of irrigation from big *nalas*, on which special water-rates are charged. How do they get the water on to the land. Do they lift it?—They have open canals.

56. Q. Has each village a separate canal of its own?—No, one canal passes through several villages.

57. Q. How do they clean the canal?—They have particular limits up to which they have a claim on the water, they know where their limit ends.

58. Q. I suppose they have to clear them sometimes. Who does the clearance?—The rayats clear them themselves.

59. Q. If several villages are interested how do they arrange their shares?—The rayats of each particular village clear the canal in their own limits.

60. Q. I suppose there is a lot of silt at the head of the canal?—Yes, they remove that.

61. Q. What rates do the rayats pay?—They pay Rs. 2 per acre, in addition to the ordinary rate.

62. Q. You say that there is always water in these canals?—Yes.

63. Q. Was there water during the famine year?—No.

64. Q. The effects of famine would be less felt, if the people were allowed to take water from the *nala*?—Yes; it is not always that the *nala* is dry; but only in very bad famine times.

65. Q. Is it the practice to cultivate the beds when the tanks are dry?—Gram and minor crops are grown: they pay a certain rate of assessment. Some of the ground is sold by auction, and is let to the highest bidder for a period of one year.

66. Q. When do they sell it?—When the tank becomes dry.

67. Q. Whom does the land on the banks belong to?—The bed of the tank belongs to Government. The land on the tank belongs to the cultivator.

68. Q. Where are the auctions held?—On the site of the tanks.

69. Q. Who holds it?—The sub-overseer, or, perhaps, the maistry, and some times, the higher officers hold it.

70. Q. Do you do this in case of all tanks?—In most of them.

71. Q. Is there much competition?—Yes.

72. Q. Regarding the Dambal tank, you say that 143 acres are under consolidated rates and 110 acres under wet rates, that makes 253 acres altogether; yet higher up you say the tank will irrigate 500 acres. The tank covers 300 acres, and does not irrigate more than 253 acres, i.e., it irrigates a little less than the area it covers?—I cannot account for the difference. Perhaps the Irrigation Department can explain the matter.

73. Q. There is also cultivation in the bed of the tank?—Yes, there is cultivation in the Dambal tank in most years.

74. Q. Is grass, which is grown in the bed of the tank also sold?—Yes; it is sold in the villages; and the people from the adjoining villages come to purchase it.

75. Q. What do they get for it?—Something very trifling. The people generally use *karbi* here.

76. Q. Suppose Government to make a new tank, must they pay compensation for the land?—They must purchase the land.

77. Q. Suppose that Government allow the land to remain with the owner, and let him cultivate it, would the people object to that?—The people would be benefited, and they would be glad to have the use of the land.

78. Q. Would the people prefer that Government should buy the land or let the people retain and cultivate it?—They would like to retain the land.

79. Q. As a matter of fact, Government always buy the land?—Yes, they can take it by force under the Land Acquisition Act.

80. Q. (Mr. Ibbetson).—How long have you served in Dharwar?—Five years.

81. Q. Straight on?—Yes, four years as mamlatdar and one year as Deputy Collector.

82. Q. When did you last serve here?—Fifteen years ago.

83. Q. When did you retire.—I retired in 1890, and I have lived here since.

84. Q. The whole district is not liable to famine; is it?—The eastern portion, which is about one-third of the district, is liable to famine.

85. Q. Does the western portion not suffer?—No, it has not much suffered since 1877.

86. Q. Were you here, then?—No, I was in Bijapur.

87. Q. You know, as a fact, that there was famine in the western portion in 1877?—Yes.

88. Q. And never since?—No; not much.

89. Q. In the eastern third, what famines can you recall?—There was famine in 1895, 1896, 1898, and the district is still suffering from famine. In 1876 and 1877 it was very bad.

90. Q. What was the state of affairs in 1891-92?—There was scarcity: I would not call famine.

91. Q. Are there any tanks in the eastern third of this district?—No, there are no irrigation tanks; because of the black cotton soil.

92. Q. Is it all black cotton soil?—Yes, except in a few cases.

93. Q. There are no wells in the eastern portion?—No, not many and for the same reason.

94. Q. If the people had water, would they irrigate the black cotton soil?—No; it is no good for irrigation.

95. Q. Not even for high class crops?—No.

96. Q. What is the depth of the soil?—Three or four feet, and then there is rock.

97. Q. Then there are no tanks or wells at all in the eastern territory?—No, there are only drinking tanks and drinking wells in some places.

98. Q. And you don't believe that if they had water they could irrigate black cotton soil?—No.

99. Q. Is there only one canal in the eastern part?—Yes.

100. Q. It irrigates 5 or 6 villages?—Yes.

101. Q. They do their own distribution; and there are very few disputes. Then why is there so much trouble in regard to the Mugad tank? If the people can manage the distribution of the canal water, why cannot they manage it on the Mugad tank? What is the difference between the two?—The quarrels on the Mugad are due owing to the tank being an ancient one. The rayats get rich paddy crops; and the people sometimes fight over the quantity of water. Perhaps the people are more quarrelsome there.

102. Q. At any rate, it is possible for the people in this district to arrange the distribution of water without disputes?—Yes; but not on the Mugad tank.

103. Q. Is the clearance of channels done by the rayat's own labour?—No; they generally employ labourers to clear the Gentli channels and sometimes the poor rayats clear the canals themselves.

104. Q. What is the annual cost of clearance, do you suppose?—They are not cleared every year, but only once in two or three years. It must cost about Rs. 100 (one hundred), that is merely my estimate.

105. Q. Have you ever heard of disputes of the apportionment of this Rs. 100?—No.

106. Q. You say that on the Dambal and Medleri tanks the rates are Rs. 14 per acre: is that for all crops?—No, for sugarcane.

107. Q. Is all the water in those tanks used?—Yes, there was never any left.

108. Q. They will use; but they cannot get it?—Yes.

109. Q. Then why do you propose to reduce the rates?—Because in famine years, there is no water, and they still have to pay.

110. Q. Is no remission given?—The rate is a consolidated one, and no remission is given.

111. Q. Is not the land measured up; and then a charge is made?—No, the charge is a consolidated one, and the money is paid in advance.

112. Q. The rate of Rs. 14 is not consolidated?—The Rs. 14 is charged for the water they take for their lands. Even, when there is no water in the tanks the assessment is charged, and no remission is given.

113. Q. Do I understand you to say that Rs. 14 is charged though there is no water in the tank?—Yes.

114. Q. (Mr. Muir-Mackenzie.)—Who takes this rate? The Revenue Department or the Irrigation Department. It sounds impossible. Mr. Beale, perhaps you can help us?—Mr. Beale.—There is no charge when the water is not taken.

115. Q. (Mr. Rajaratna Mdlr.)—On Gentli nala a special rate for irrigation is charged?—Yes, Rs. 2 an acre for water advantages, independently of the land assessment.

116. Q. No matter what crops are grown?—Yes; they generally grow sugarcane and vegetables.

117. Q. What area is assigned to each rayat?—No definite area is fixed; some have five acres; some have six; none less than two acres.

118. Q. Can they sell the water to other rayats?—No, unless they sell their land also.

119. Q. The nala was constructed by the rayats at their own expense and the water practically belongs to them. Can they sell it and levy a water-rate just as Government does? No, they cannot sell the water.

120. Q. Why should they not sell the water and allow other people to irrigate?—It is not the custom.

121. Q. Is there anything to prevent them from doing so?—I believe there must be some departmental order preventing them from doing so.

122. Q. Is there water available for the irrigation of an additional area?—Yes, about 40 or 50 acres more may be irrigated, if sanction were given, as there are other villages through which the nala runs.

123. Q. Could it be utilized without affecting the interests of the owners of the nala?—It could be done without interfering with their interests.

124. Q. Then why do the owners object to supplying water to other people?—Because the supply will be less for their fields.

125. Q. You say that 40 or 50 extra acres could be irrigated?—Yes; but the owners won't allow it.

126. Q. Suppose we allow them to levy a water-rate. Do you think they would consent?—No, they would never consent.

127. Q. Would they not make a profit?—No, they think they would be losers thereby.

128. Q. What is the area they irrigate now?—About two hundred acres.

129. Q. If water is available for 40 acres more why should they object, if they are allowed to levy a water-rate of, say, Rs. 2 an acre?—The present rayats would not be benefited.

130. Q. Has your son-in-law applied for permission to irrigate more land?—No; he is a 2nd class Sirdar living at Mundargi.

131. Q. Does he now object to the extension of irrigation?—Yes.

132. Q. Has he any other land under the nala, besides that already referred to?—Yes.

133. Q. Has he applied to the Collector to irrigate that?—No.

134. Q. Why not?—I cannot say.

135. Q. As regards takavi loans, you say that corruption of the village officers and delay in payment deter people from applying for advances freely. And you propose that committee of influential native gentlemen should be appointed. What guarantee have you that they will behave any better than the village officers?—They will be people of position and, therefore, honest.

136. Q. Do you think it would be safe to go on the result of their inquiries?—Yes; they would have to ask the mamlatdar's assistance in their enquiries.

137. Q. Would they not be afraid of the tahsildar coming down upon them?—No, I don't think so, because they are men of position and often-times educated.

138. Q. If the money is misspent, would not the tahsildars come down upon them?—No, they would hardly misspend the money.

139. Q. Then, why cannot the tahsildar do it himself?—Because he has to travel, and if he had to give advances the people would have to travel, which would be very troublesome.

140. Q. He can make inquiries in the villages he visits?—Yes; but he may take two years to go round in his taluka, and he might have criminal and other cases to attend to.

141. Q. As regards the disputes about the distribution from the Mugad tank, why do the people not go to the Circle Inspector, instead of to the Collector, to have their disputes settled?—The Circle Inspector draws Rs. 30 (thirty) a month; and he has multifarious duties to perform, the extent of his beat extending over forty villages.

142. Q. You say that the profit from cane cultivation is Rs. 14-12-0 per acre. Do you speak from personal experience?—Yes, from personal experience and from information from my son-in-law, and other practical men.

143. Q. I want to know if your estimate of Rs. 14 12-0 is not very low?—No, it is not very low.

144. Q. We have had any amount of evidence to show that the profit on sugarcane has been more than Rs. 100 per acre?—My experience relates to the Dambal tank only.

145. Q. (Mr. Muir-Mackenzie.)—Have you ever grown sugarcane on your own lands?—No. My son-in-law gets 18 Hrs of "gool" per acre.

146. Q. How much is one her?—Eight hundred and thirty-two tolas make one her, 20 tolas make one ser; and one her is valued at Rs. 10; and 18 hers is equal to Rs. 180 in value. He spent Rs. 165 to raise this crop.

147. Q. Then it does not pay?—It gives him some return.

148. Q. What is the assessment on that land?—Rs. 10 water-rate; Rs. 1 land assessment per acre.

149. Q. It will pay him better if he cultivate dry crop?—Yes; but the rainfall is so scanty that a crop cannot be assured.

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Mr. Shirhatti. 150. Q. (Mr. Rajaratna Mdlr.)—The average area irrigated per well in Dharwar is given as $\frac{4}{5}$ ths of an acre, as compared with over three acres in Sholapur and 2·27 in Belgaum. Can you explain the difference?—I cannot.

151. Q. What is the average area irrigated in Dharwar per well?—From one to five acres.

152. Q. Have you any reason to suppose that it is less than in Bijapur or Belgaum?—I see no reason for any difference between here and Belgaum.

153. Q. There are about 2,400 irrigation wells in Dharwar. Are there any facilities for the construction of more?—Yes, a few more could be constructed.

154. Q. Do you think that the rayats could be induced to construct if Government remitted the water-rate?—Yes, if the water-rate was exempted for a certain number of years, a few rayats might do so.

155. Q. What period of exemption would you suggest?—Twenty years.

156. Q. You say that "I even go so far that, in order to encourage the multiplication of such wells, the Government should be kind enough to make advances to energetic, certified poor people, without any interest at all". To what extent do you think the number of wells would be increased in the whole district? Would it be doubled if this concession were allowed?—Perhaps one hundred wells in each of the eleven talukas. Say, one thousand altogether. That is the maximum limit.

157. Q. (Mr. Ibbetson.)—Including the three black soil talukas?—No, the three eastern black soil talukas must be excluded except, a few villages in the Mundargi Peita of the Gadag taluka, and a part of the Ron taluka.

Witness No. 83.—Mr. JANARDAN SADASHIV Athavle, Pleader, Gadag.

Answers to printed questions.

Mr. Athavle. As very little time was at my disposal I could not collect information for the whole district of Dharwar. Dharwar district has eleven talukas of which Gadag is one, I am a resident of Gadag and any information that applies to Gadag is equally applicable to Navalgund and Ron Talukas, as the character of the soil and climatic influence are one and the same. I therefore confine myself to Gadag Taluka.

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Point No. (2) (a). The gross and culturable areas and the proportions of the latter which are protected by Government irrigation works, by private or village works, or by wells respectively are as follows:—

* Acres gross area.

* Acres culturable area.

580 Acres protected by Government irrigation work (only one tank at Dambal, a petha town in Gadag taluka). The bed of the tank is 436 acres and the area of the feed channel is 70 acres 4 gunthas. This tank holds water 114·182 millions of cubic feet, or 11 feet height when full.

(b) Character of the soil.—Black, red, the mixture of black and red and sandy and red with sand.

(c) Extent to which cultivation is dependent on artificial irrigation:—

* Acres.

(d) Rainfall.—24 inches.

(e) Is there ordinarily a demand for water in the Deccan during south-west monsoon?—Yes; and the more so or greater the demand if the rainfall in the previous year had fallen short of the average.

(f) What are the crops which require irrigation and how many waterings do they require and at what times of the year?—Paddy, sugarcane, plantain trees, betel-leaves, guava, lemon, and pomegranate trees, onions, potatoes, chillies, and all sorts of vegetables and tobacco. All these require two waterings in a week throughout the year until the crop is ready for harvesting, but one will do when the rains fall in sufficient quantity. I say throughout the year because the duration of the crops is not the same as shown below:—

Paddy.—Two crops six-monthly, November to April and May to October.

Sugarcane.—One crop, eleven or twelve months from February.

Plantain trees.—Only one crop twelve months after plantation from June. The stem is preserved because the original tree begets young ones which again yield fruit in their turn. The stem of the mother-tree is preserved for three years.

Betel-leaves.—Two crops every six months. Plants live for ten years if well nourished; first crop is raised three years after plantation.

Guava, lemon and pomegranate trees.—Two crops, one full and the other half. First crop is raised twelve months after plantation if well nourished. The former trees live for upwards of 35 years and the latter six years.

Chillies.—Only one crop in twelve months and no more.

All other vegetables.—Only one crop in six months and no more.

(g) How is the distribution controlled?—By irrigating well-water by means of a *mot* (a leather bag containing 12 to 16 ghadas or 30–40 gallons of water).

(h) And in what form is irrigation revenue realized? The revenue is realized by consolidated assessment collected by two instalments, or by fixing a water-rate or tax on lands not subject to consolidated assessment, but receiving water from Government tank whenever there is a surplus after giving it to the owners of lands subject to consolidated assessment.

Point No. 3.—Experience as regards black soil. Small tanks constructed in black soil hold water and high earthen dams can be made without masonry core walls. In the case of land being irrigated, being black soil, there is no demand for water during seasons of average rainfall. But even in short drought there is demand for water. In such soils the irrigated area does not show a falling-off in years of fair or good rainfall owing to slack demand and the revenue is not more precarious on this account than on tanks commanding other classes of soils. There has been a desire for irrigation works on the part of owners of black soil, and the construction of tanks for such soil is considered remunerative and as important as for other classes of soil. But the cost of constructing tanks in such soil is comparatively very large and private owners of lands cannot be expected to construct the tanks with their monies without free loans from the sarkar on low rate of interest and a long period, say, 20 years, for repayment of the loan.

Point No. 6.—District or Village works.—The district or village works are constructed by the joint funds of the particular village in which the tank is constructed, the District Local Board and the Government grant. But the cultivation is not dependent on them as these tanks are constructed for the purpose of drinking water both for men and cattle. Ordinary repairs to such works are made at the cost of the villagers and extraordinary or special repairs at the cost of the District Local Board or of both. To all these sorts of tanks there is but one exception and it is the tank at Dambal, and the aggregate extent of cultivation dependent on this tank is 580 acres and the Government is responsible to maintain it under the Irrigation Act. The average annual expenditure incurred by Government on this work is Rs. 140, not including expenditure on relief work during late famines. Irrigation is realised or remissions of land revenue are given according to the orders of the Government when the works fail. No new works of this class have been constructed of late years; nor even as famine works. Such works are not undertaken by District Boards or by private landowners as they are not permissible under the District Local Boards Act and are beyond the means of the District Boards or private land-owners. It is not desirable that District funds should be expended on such works unless the Government gives loan to the District Boards. It has not been the practice for Government to encourage the construction of such works by loans to District Boards. The protective value of these works can be increased by devoting more money and greater attention to their up-keep and by encouraging the construction of new works. Local responsibilities might be enforced in this connection by permanent increase in consolidated revenue and by making the particular village or district benefited by the new works bear a certain portion of the cost incurred by Government or by the District Boards with the help of the

Government. Construction of such works as concerning village water-supplies for men and cattle is equally important.

Point No. 7.—Total area irrigated by wells in ordinary years is * acres, and in years of drought is * acres. The number of new wells constructed annually during last ten years is as shown below :—

	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.
* No.											

Government has assisted the construction of such works by making advances, viz., Rs. * No concessions are given to the constructors of new wells. It is possible and desirable to stimulate the construction of new wells by more liberal advances and inducements. More than half the

number of wells have been affected by the droughts of 1899—1901 as shown below. * Some of those which ran dry were deepened; and the result was that the average annual crop was obtained to a fair extent. Number of wells that failed or were abandoned cannot be ascertained, but is very small. Average depth of water below surface is 12 to 15 feet, that is, if a well be sunk 40 feet deep, water is found 28 or 25 feet below surface, and the depth of water is 12 or 15 feet. Cost of wells used for irrigation and area served by each are as shown below :—

Cost in rupees.	Dimensions.	Area served.	Remarks.

* NOTE.—Only five days were at my disposal, and I could not get the figures in time. I shall forward the figures later on or give them at the time of giving evidence before the Commission.

1. Q. (*The President.*) You are a pleader and practise at Gadag?—Yes.

2. Q. You are a native of that place?—Yes; I know the taluka very well.

3. Q. The information you have given in your printed memorandum is about that taluka?—Yes.

4. Q. It is in the eastern part of the district?—Yes.

5. Q. You say that paddy requires two waterings a week throughout the year. Is much paddy grown in your taluka from November to April?—Not in my taluka. Much is grown from May to November. In the adjoining taluka it is grown from November to April.

6. Q. You say, "There has been a desire for irrigation works on the part of owners of black soil and the construction of tanks or such other works is considered remunerative and as important as for other classes of soil." Is that deep black cotton soil?—Yes, it is deep black soil.

7. Q. Do the people irrigate it?—No, but they want to do so.

8. Q. There is only one tank in your taluka—the Dambal?—Yes, they grow paddy, sugarcane, and vegetables under it.

9. Q. Do they grow cotton, and would the people take irrigation for that crop?—Yes, they would irrigate cotton; they do not irrigate it now.

10. Q. To point 6 you say, "The district or village works are constructed by the joint funds of the particular village in which the tank is constructed, the District Local Board and the Government grant." Does the District Local Board have much to do with irrigation tanks?—No, the tanks referred to are drinking water tanks.

11. Q. Does the Dambal tank do a great deal of good?—Yes.

12. Q. What happens to it in a year of drought, does it dry up?—Yes.

13. Q. (*Mr. Muir-Mackenzie.*) How is the water-supply obtained generally for the villages in the Gadag taluka?—The water-supply is generally obtained from wells.

14. Q. How deep are the wells?—About 40 to 60 feet.

15. Q. That would be the usual depth to which a well would have to be sunk if it was wanted for irrigation?—Yes.

16. Q. What would be the cost of such a well?—A well 30 to 40 feet in diameter would cost about Rs. 4,000, and more if the soil is loose and gives way if not built with stone and chunam.

17. Q. Are there not smaller wells?—Yes, some are 20 feet in diameter, but never less.

18. Q. How many *mots* would there be on such a well?—Two *mots* if the water-supply is good, otherwise only one *mot*.

19. Q. How many acres would a well of that size irrigate?—A 20 feet well would irrigate about 5 acres.

20. Q. (*Mr. Rujaratna Mudaliyar.*) Why are the wells so big; would not a well 10 feet in diameter do well if it was dug deeper?—No.

21. Q. (*Mr. Muir-Mackenzie.*)—Why not?—A small diameter would not do, as sufficient water would not be obtained.

WITNESS No. 84.—MR. D. C. BOYD, I.C.S., Acting Collector of Dharwar.

1. Q. (*The President.*)—You are Collector of Dharwar?—Yes.

2. Q. You say that very little is taken in the way of *takavi* for wells?—Yes, very little for wells. In Belgaum, where I was for six years, you cannot sink wells in black cotton soil. And you can hardly do so in this district; consequently there is a small demand for *takavi* for that purpose.

3. Q. Is the greater part of the district black cotton soil?—No, only one-third. The western part is hilly and woody and gets lots of water. And there is very little demand for wells.

4. Q. In the part where there is black cotton soil they don't want wells. Is it because the spring level is so low?—Yes, they have to go down 100 feet to get water, and then they find that it is brackish.

5. Q. (*Mr. Ibbetson.*) Is the black soil very deep?—From seven to ten feet.

6. Q. What is below?—Sandstone and rock.

7. Q. Supposing the people are given wells for nothing, could they use them?—No.

8. Q. Having that source cut away, and considering there is a distinct famine zone in this district, we are thrown back upon tanks and canals, what would be the prospect of the people in the black cotton soil districts, taking water?—Tanks and canals are the only form of irrigation works for this district. The Gokak runs through black cotton soil; and has magnificent crops, but the soil is only three to five feet deep.

9. Q. Why are there so few tanks in this district?—There are very few big works; but there are 2,000 small village tanks irrigating from two to four hundred acres, on which consolidated assessment is charged.

10. Q. Are these tanks in good order?—They vary very much. They were built hundreds of years ago. No one knows by whom. Probably by some previous Government or by some rich people. The people under them are now not rich enough to maintain them. Government levy a low consolidated rate, and does not grant remissions.

11. Q. Have the people a feeling that they have elsewhere, that it is the business of the Government to keep them in order?—Yes, they think that the Government should repair the tank. When the people pay the 10 per

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Mr. Boyd. cent., which happens in very few cases, the tank is repaired : not otherwise. I would like to suggest that the 10 per cent. contribution be abolished.

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12. Q. Would you recommend that all the tanks should be repaired as money and officers are available?—Yes. I may mention that Mr. Shoubridge states that owing to the 10 per cent. contribution he can only spend Rs. 50,000 a year, while the establishment cost is also Rs. 50,000; whereas, if he could spend four times as much, were it not for the 10 per cent. restriction.

[Mr. Muir-Mackenzie.—I don't think I am premature in announcing that Government have decided to abolish the 10 per cent. contribution for repairs of tanks.]

[Mr. Rajaratna Mudaliyar explained that the Madras Government repaired all small tanks by the agency of the Revenue Department.]

13. Q. (The President.) Do you think that Government, having once put these tanks into repair, should go on maintaining them, or do you think it would be for the people to keep them in repair?—I do not think the people have the capital or the combination to do it.

14. Q. You say that the people don't mind *takavi* in ten years?—No, the people do not object to paying back the *takavi* soon, if they get any benefit from it.

15. Q. You are not alluding *takavi* for wells, because the people do not take any for that?—No; I was alluding to what was said at Bijapur regarding the fact that the people do not like to pay back the *takavi* soon.

16. Q. When the cultivator borrows from the Sowcar, he never proposes to repay?—I have given out many thousands in *takavi*; but I have not heard a single instance of people being unwilling to return the loan in time. When cultivators borrow from a Sowcar, they in many cases mean never to repay and expect to pay the interest as long as they live. Their custom is either to pay a debt soon or not at all. They take *takavi*, meaning to repay it and knowing they must. So they are quite willing to repay it fairly soon.

17. Q. Do they complain at all of the rate of interest charged?—No, the Sowcar charges from 30 to 40 per cent. But they do complain of the delay in getting the advances. That is a question merely of having a larger establishment.

18. Q. If we are to have protective works in this district, and wells are not possible, we must have either tanks or canals. I understand that certain projects have been prepared; can you mention any of them?—Instructions were left to me by my predecessor to push on several of them in case of future famine occurring in this district.

19. Q. Which is the most important of them?—A new tank at Pudukkatti which is north of Dharwar.

20. Q. Is it a small tank?—No, it is a new tank, which will cost 6½ lakhs of rupees, and will prove useful to the North-West Frontier of the famine area.

21. Q. Would it get a good water-supply?—It is bound to be successful.

22. Q. Of course the anxiety is that tanks not connected with a rainy zone may fail in dry years?—Part of a catchment is in a sphere which is generally well supplied with rain.

23. Q. There is another tank at Kardikop in the Hubli taluka, six or seven miles from Hubli?—Yes.

24. Q. (Mr. Muir-Mackenzie.) That is rather far from the famine tract?—Yes, that is true, about 25 miles.

25. Q. Are there any other works that you would like to mention?—Yes, the extension and repairs of the Dambal tank. This tank is in famine area and is very useful. All these are very important. The most important of them, however, is Pudukkatti. We could easily spend 13 lakhs or 14 lakhs very usefully on these works if Government could let us have it. I see at page 338 of Mr. Beale's report that Mr. Strange condemned the Pudukkatti tank, as it submerged several villages?—It would have a canal of six or seven miles, which would do a great deal of good. Mr. Gibb, my predecessor, thought that any submerging that might result will be counterbalanced by the amount of good that is likely to accrue. The villages are very small indeed.

26. Q. Are there any other works?—No, I would only recommend these three, as useful for future famines.

27. Q. Are they situated in black cotton soil areas—Kardikop is mostly in black cotton soil; and Pudukkatti is in half-and-half; but I have not seen it.

28. Q. (The President.) We have had a good deal of discouragement in Bijapur, where these tanks are; but the people persistently refuse to use them; so that one is a little anxious about making tanks in black cotton soil?—Yes, but I would point to the Gokak canal of which the water is used. However, in the best black cotton soil, with the least rain, the people get a good crop, so that there might be no demand for irrigation in good years.

29. Q. With regard to the small tanks under the Revenue Authorities, do they apply to the Executive Engineer, to repair them, or do the owners apply straight to the Public Works Department?—The owners apply in the first instance to the Collector to take their 10 per cent. contribution.

30. Q. Is no information given to the Executive Engineer till the money is collected?—They will probably tell the Executive Engineer at the same time.

31. Q. Does the Executive Engineer not receive the application in the first instance?—No, the Collector receives the application and sends it to the Executive Engineer to make the estimate.

32. Q. An argument has been used in favour of the 10 per cent. contribution that it best indicates the comparative urgency of the different works. Suppose you had no contribution at all, how would you decide the order in which to execute the works?—The urgency of the repairs could easily be settled between the Executive Engineer of the Irrigation Department and the Collector.

33. Q. I suppose there will have to be a complete survey and systematic record kept of the conditions of the various tanks?—Yes, the Executive Engineer knows pretty well in what conditions the tanks are; and so does the Collector and Assistant Collector.

34. Q. There are 200 tanks in this district?—Yes.

35. Q. If you receive applications for the whole 200, it would be difficult to determine which should be dealt with first?—No; I do not think so.

36. Q. Of the various schemes proposed for the district, which would you prefer to see pushed forward first?—The Pudukkatti tank.

37. Q. On any of these works could famine labour be employed?—Yes, famine labour could be employed on the Pudukkatti tank.

38. Q. Have you a number of tanks entered in your Famine Relief programme?—There are very few tanks entered on the famine programme. They are of very little use as famine relief works in this district.

39. Q. Would the people go some distance to work on a tank?—Yes.

40. Q. How far would they go?—Fifteen miles is about the limit, but it takes a very bad famine to make them go fifteen miles.

41. Q. And apparently nothing can be done for this most exposed part of this district?—I do not know what is possible to do for the black cotton soil area in the way of irrigation, except the Pudukkatti tank, unless there is some prospect of damming the Malprabha river.

42. Q. Whatever is done, the water will only be required in famine years?—Yes, only when the rain fails.

43. Q. In famine year, they would not take water for cotton?—The crop sometimes fails in a famine year; but I have never heard of cotton being irrigated.

44. Q. If they had tanks, would they grow *juari*?—They might grow *juari* or wheat.

45. Q. Would they grow rice?—No, that would involve too great an expenditure.

46. Q. (Mr. Ibbetson.) Too great an initial expenditure. How long have you been in Dharwar?—Six weeks this time, but I was here for a year eleven years ago.

47. Q. Where were you before you came here?—In Belgaum and the Kanara district.

48. Q. You say many of the small tanks are out of repair. What is the matter with them?—They are silted up.

49. Q. Apart from that?—So far as I know that is all.

50. Q. Would you propose to clear them out?—That is usually unsuccessful.

51. Q. And what would you do to them?—I do not quite know how the repairs should be done.

52. Q. You think, if they were handed over to the people, they would not repair them?—No, the people certainly would not do the repairs.

53. Q. Mr. Shirhatti told us of certain channels which the people repair themselves at a cost of about Rs. 100?—Yes, but that is an exception.

54. Q. Supposing we legislate, and make the people responsible, could not a good Mamlatdar make them combine and keep the tank in repair if he had the necessary power at his back?—No; in this district the people are so unsophisticated as to be incapable of combining.

55. Q. If the repairs were necessary the Mamlatdar could use the legislative power?—I don't think the necessary pressure could be applied; and the Mamlatdar has not enough technical knowledge to know what repairs are required when a tank is out of repair.

56. Q. Have you had any experience of paying *takavi* in ordinary years?—Yes.

57. Q. What you have told us, then, is not based merely upon famine experience. You say that there have been many years of famine in this district. Mr. Shirhatti told us only a few?—There was not famine in 1899. We have had scarcities requiring relief, but no regular famine since 1876.

58. Q. (Mr. Rajaratna Mudaliyar.)—You say that there is no difficulty in recovering the *takavi* loan?—I have never known a case in which the loan has not been paid back.

59. Q. In most cases, were not the loans very small?—No, they range from Rs. 200 to Rs. 2,000. The average is about 300 or 400 rupees.

60. Q. What kind of works you lend the money for?—Weeding, repairing embankments, etc.

61. Q. Would these works cost large sums?—Not very, but weeding takes a lot of time: they spend some of the money and keep a little. We cannot prevent a little misappropriation. They don't take more than a small percentage.

62. Q. Would not inspection by the Revenue Officers prevent this misappropriation?—Yes, but we have not the establishment.

63. Q. What staff is required for an efficient inspection?—We should have additional Mamlatdars.

64. Q. What amount was advanced in the district of Belgaum in the famine year for wells and other improvements of land?—Speaking from memory, about 1½ lakhs. (The President quoted proper figure, viz., 2,15,955.)

65. Q. Were any steps taken to check the work under these advances?—The Revenue Officers inspected the work sometimes before, but generally afterwards. The Assistant Collectors inspected a large number of works. The inspection of the *takavi* works is a very important part of his Revenue work, if he can only get the time to do it.

66. Q. Is he required to submit a report?—Yes.

67. Q. As regards the Gokak canal, the Deputy Collector told us that, if the extension could be carried out, a very much larger area could be irrigated?—I cannot tell you anything about that, as it is six years since I was at Belgaum.

68. Q. (Mr. Muir-Mackenzie.) You said the people who borrowed money for land improvement were content to pay it back within the reasonable period of ten years. Don't you think it would be advisable to extend the period so as to attract the people of a less provident class?—I don't think there is any need to do so. It might make the people feel that the advance need not be returned.

69. Q. You would not approve, even if an experiment is made in that direction?—No, all that is wanted is promptness in dealing with applications for advances and thorough, but not too severe, inspection of the work done.

70. Q. There has been a good deal of evidence that the people are reluctant to borrow, owing to the rigidity with which the instalments are recovered. You do not agree with that?—No; I have never come across that. Hardly any one

asks for a postponement beyond the ten years. If he asks, Mr. Boyd. he gets it. The advances are given for weeding and embankments, and sometimes for conversion of dry into rice lands. The profits on those come soon, and they can refund early. If you give *takavi* for a well, the period might be extended to fifteen or twenty years. 13 Jan. 02.

71. Q. You would not even recover interest until the well has been in use for some time?—No.

72. Q. I thought you meant a pauper rayat would come on to relief work, for instance?—I do not call a man who has land a pauper. Only coolies come on to relief work. It would take two years of famine to bring a rayat landowner on to relief works in this district.

73. Q. Can famine labour be employed on *tals* or small embankments?—No, the people could do it for half the cost themselves.

74. Q. Then it would not be possible for Government to use famine labour on these works?—It would be difficult to decide whose embankment should be made. The works would be so scattered that supervision would be quite impracticable.

75. Q. You need not make them on a large scale?—The people here have holdings of about 15 acres each.

76. Q. (Mr. Ibbetson.) Why not estimate the amount of work that has to be done, and make over gangs of famine labourers to the people to work on the land, telling them to employ them for a definite number of days, and get what work they have done?—The people could not get good work out of famine labourers, who do as little as they can.

(Mr. Muir-Mackenzie to Mr. Ibbetson.) You have a head man in the Punjab villages, who could make the people work: we have not?—(Mr. Ibbetson.) That is the crux of the whole thing.

77. Q. As regards the inspection of *takavi* work, I suppose something more might be done: do the Assistant Collectors inspect the boundary marks?—To facilitate the *takavi* inspection work, the boundary mark inspection might be relaxed, as the marks are in an excellent condition.

78. Q. About the repairs of small tanks, you seem to have read the orders of Government to mean that the tank is not to be repaired, unless the contribution of 10 per cent. is paid?—I understand that 10 per cent. contribution can sometimes be foregone, but seldom is.

79. Q. (The President.) Is there any other point you would like to call our attention to?—No.

80. Q. (Mr. Muir-Mackenzie.) Do any people pay for water which they do not receive?—Yes.

81. Q. Would you say 10 per cent.?—About 5 per cent.

82. Q. Do you mean 5 per cent. of the tanks or 5 per cent. of the area?—Five per cent. of the area.

83. Q. Do you mean in ordinary years, or in years of short rainfall?—Often in ordinary years if the tanks are in a bad state of repair.

84. Q. Do you think that Government ought to abandon some of the tanks, or put all under repairs?—I think they ought to abandon the one-man tank, and repair all the others.

85. Q. There was a rule in 1895 that, without the sanction of Government, repairs should not be undertaken if they cost more than 10 years' water-revenue. Do you think that rule should be retained?—No, I think not; I think the rule might be relaxed in the case of certain good tanks. There are several fine big tanks in this district which badly need repairs. One of them, that at Hirekeur, irrigates over 500 acres. The repairs to it would be costly; but it is well worth keeping up, and at present many of the people pay consolidated rates and get no water; and they have suffered in this way for a long time. I may add that it is hopeless to expect to run tank irrigation in these parts profitably to Government.

WITNESS No. 85.—MR. H. B. SHOURBRIDGE, Acting Executive Engineer, Dharwar Irrigation.

1. Q. (The President.) You have only just come to Dharwar?—Yes; I have only been here 4 or 5 months.

2. Q. Where were you before that?—In Sind.

3. Q. So that you have had very little time to ascertain the requirements of the district?—I have seen a good many tanks during the last few months.

4. Q. Have you any suggestions to make in regard to irrigation works?—I think that tank repairs should be

carried out by Government, as the people cannot do it themselves. They do not carry out even the most petty repairs that are required.

5. Q. Putting all the tanks into repair would involve a great expenditure?—Yes, and a good deal of plan work would have to be done.

6. Q. In many cases would it not be merely a matter of raising the bunds so many feet?—Yes, but in many of

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these tanks there are no *pakka* outlets and no waste weirs.

7. Q. No waste weirs at all?—In most cases the waste weirs are merely cuts, some have no waste weirs at all.

8. Q. Could you give us an estimate of what would be the cost of repairing the tanks in the Dharwar district?—I could not say.

9. Q. (Mr. Muir-Mackenzie.) Twelve or thirteen lakhs was, I think, the amount of the estimate which came before the Government.

(Mr. Higham.) I believe the figure is 13½ lakhs.

10. Q. After the repairs are finished, there will always be current repairs?—Yes, which the Department will have to do. The owners live away from their fields which they let to tenants, and as long as these latter get water, they do not care what the state of the tank is.

11. Q. You think the work of repairs ought to be taken in hand?—Yes.

12. Q. How much can be done per annum?—I think more might be done if our methods were a little less minute.

13. Q. Are you employed on irrigation alone?—Yes.

14. Q. Do your irrigation boundaries go beyond this district?—They go into Kanara.

15. Q. Not Belgaum and Bijapur?—No.

16. Q. Do you know of any large project worth considering in this district? Any project for ghat storage from which an unfailing supply could be got?—There is only the Madag tank; the Dharma Canal is not in the famine area.

17. Q. The Madag Tank is on the borders of Mysore?—Yes; I have not seen it, but it strikes me as a good project.

18. Q. Would the Asundi tank be filled by the Madag?—I do not know.

Mr. Beale explained that it would not, as the Asundi is up stream.

19. Q. Is there any other project which occurs to you which you would like to suggest?—No.

20. Q. What about the order in which you take up the repairs of tanks?—The petition is sent to me, and not to the Collector. I send it to the Sub-Divisional Officer for report, and he tells me roughly what the repairs will cost. Estimates are prepared in the order of receipt of application. I do not want to have applications which involve the scattering of establishments all over the place. I cannot sanction the expenditure, the estimates go to the Superintending Engineer, and the allotment is only made after approval by the Collector. I want to do away with the areas and take up one block or catchment at a time. I would call for applications giving notice that in a certain area the tanks will be repaired.

21. Q. (Mr. Muir-Mackenzie.) You wish to repair the tanks by catchments. When the order for the removal of the 10 per cent. contribution is received, you can arrange matters as you like?—Then the question of estimates will come in under the present rules; the estimates have to be prepared very exactly; and if there is an excess of more than 5 per cent., a revised estimate has to be submitted. This necessitates very close surveying and a good deal of waste of time. I think we should be given a freer hand.

22. Q. (Mr. Higham.) But when the estimate is exceeded, revised estimates need not always be necessary: any excess can be passed on completion of the work?—It is best to get it passed beforehand, so as to save a long list of explanations.

23. Q. How much can you sanction for repairs yourself?—I can only sanction repairs up to Rs. 200. Very little can be done for Rs. 200.

24. Q. How do you work out the limit of ten years revenue? Suppose the estimate of the work came to about ten years' revenue, how many years after that can you go on spending money on the same tank?—The previous estimate of the tank has to be reported.

25. Q. But, if you have to make repairs within four or five years of the previous repairs, does not the limit come in?—The Superintending Engineer decides whether the matter should be sent up to Government.

26. Q. Can you say what your present annual expenditure is on second class tanks?—Our present expenditure is Rs. 40,000 per year on all tanks. Previous to 1891 and 1892, we only spent money on tanks irrigating fifty acres

or more. Since then we have repaired all classes of tanks except "one-man" tanks.

27. Q. Did you prepare the estimate of Rs. 13½ lakhs for the repairs of tanks in this district?—No, the estimates, I believe, were prepared for the Tank Commission.

28. Q. I suppose the estimate of 13½ lakhs is required for improving and restoring the tanks quite independent of what you are now spending every year?—I would rather think it includes it.

29. Q. What is the total revenue from all tanks?—I cannot tell you for the tanks irrigating under fifty acres. There are 473 second class irrigation works, the revenue of which is Rs. 1,75,000.

30. Q. These irrigate over fifty acres?—Yes.

31. Q. And the revenue from each is about Rs. 400. Then there are about one thousand tanks, about which you know nothing. Supposing the average income of these to be about Rs. 200 each, the total revenue will amount to three or four lakhs of rupees, and the proposal is to spend only four years' revenue in restoring them?—Yes, but you must always allow for petty repairs.

32. Q. That is a long way below the ten years' limit?—The ten years' limit does not apply so much for the big tanks; smaller tanks are the most difficult to repair under the ten years' limit.

33. Q. Are you engaged in working out any projects now?—Yes, several for the repairs of small tanks.

34. Q. Have you any other works under your charge, besides tanks?—Besides small tanks, I have the Dharma Canal, which feeds several tanks.

35. Q. Are you working up any proposals for new irrigation works?—No, I have not investigated the projects mentioned in Mr. Beale's report.

36. Q. (Mr. Ibbetson.) Speaking about the repairs of these tanks, you say a certain amount of surveying is necessary. We were told the other day that a school boy could do all the surveying necessary on a sheet of note-paper; probably that was intended to be an exaggeration; but is it anywhere near correctness?—For tank repairs, a surveyor leveller is required on Rs. 40 to Rs. 80 per month.

37. Q. He could not work out the project?—Yes; the project might be worked out by him.

38. Q. He could not settle the question of the waste weir?—No; the Executive Engineer would have to see to the waste weir and outlets.

39. Q. (Mr. Muir-Mackenzie.) Does the addition of a waste weir considerably improve the capacity of a tank?—The capacity is improved a little if the waste-weir is raised. The work is done chiefly to prevent the tank from breaching.

40. Q. It does help it to irrigate more land?—No; not unless we raise the water-supply level.

41. Q. You don't try to raise the area irrigated?—We are not supposed to increase the area of irrigation without the sanction of Government.

42. Q. Did you find many of the tanks breached?—No; not many are breached. I found one breached which the Public Works Department had mended three years ago. The breach was not reported, and the tank had never held water since.

43. Q. Why was the matter not reported to the Collector?—I asked the Patel why he had not done so; and he said that it was because he was a new man. I ordered the repairs to be done at once, but I have to send in an estimate for it, though it would cost less than Rs. 100.

44. Q. Would it be worth repairing all the tanks?—No; some do not fill, and it would not be possible to raise the supply level.

45. Q. The principal fault of these tanks is, I understand, that they silt up.—I don't think so. It is bad in the upper catchments, much less further down. A small raising of the supply level remedies that.

46. Q. Does it not submerge land which the people do not like to see submerged?—The extra flooding is not very important.

47. Q. Could the increase of silt be prevented by annual operations by the people?—The silt cannot profitably be cleared. It is much better to raise the supply level.

48. Q. Is there any scope for new small tanks?—No, not in the areas I have visited.

WITNESS No. 86.—MR. W. L. CAMERON, Superintending Engineer, Southern Division.

Answers to printed questions.

1. The districts to which the following answers refer are those of the Southern Division, above Ghats, *viz.*, Satara, Belgaum, Dharwar, and Bijapur.

I now have administrative charge of the Public Works in the Southern Division.

2. A statement—Appendix A—is attached showing the rainfall at the head-quarter stations of the above districts for each month during the last ten years.

3. There is no obstacle to the extension of irrigation arising from—

- (1) Sparsity of population ;
- (2) Insufficient supply of cattle ;
- (7) Fear of enhanced rent of revenue assessment ;
- (8) Uncertainty of tenure or defects of the tenancy law ;

nor is (3) want of manure a bar to a moderate extension of irrigation. The quantity of manure is, however, in most parts limited, and no rapid increase is possible in the more highly irrigated crops such as sugarcane.

(4) There are large tracts of black soil which cannot be irrigated, but there are large areas of suitable land under command of irrigation works which are capable of being, but are not ordinarily, irrigated.

(5) In years of scarcity on, I think, every work, scores of applications for water have to be refused owing to the probable insufficiency of supply, and water has to be given in rotation to those who have obtained permission to irrigate. Even under such circumstances, however, people beg for water and offer to accept all risks themselves and to ask for no remissions in case of failure of crops. Such applications are, of course, disregarded, but they tend to show that people are willing to take any reasonable risk, and the thought that, in an ordinary year, the supply may be uncertain, does not deter them from asking for water.

(6) Lack of capital, as far as I have been able to ascertain, is no obstacle to the extension of irrigation, except in the case of a crop such as sugarcane, which requires a heavy outlay in the purchase of manure.

(9) As a rule, the people are content with the crops grown naturally, and if the rains are good, the difference in value between irrigated crops and those of the same kind grown in the rainfall does not appear to be sufficiently great to cover the cost of the water supplied and other expenses incidental on irrigation.

6. The irrigated area is so small compared with the total area under cultivation that it in no way affects the agricultural labour market.

8. On the Gokak Canal in the Belgaum district, which passes through a somewhat dry tract of country, the cultivators are keenly alive to the advantages of irrigation, and all the water that can be spared for irrigation is utilized. Any extension of the system would be welcomed by the people. The total culturable area under command of the present length of canal is 17,627 acres, and as much as 10,508 acres or 60 per cent. of the whole was irrigated in 1900-1901.

On what are known as Second Class Irrigation Works, that is to say, those which are maintained and managed by the cultivators (in the Southern Division chiefly small tanks which contain a sufficient supply to keep the rice crops depending on them alive during breaks in the monsoon), the rights to water are jealously guarded. On these works a consolidated rate is charged, and the people are required to pay the assessment, whether they irrigate or not.

9. (1) and (2) In the Southern Division there are, as far as I know, no private canals as are to be found in Sind.

(3) A statement (Appendix B) is attached giving the crop rates on the canals in the Southern Division. The rate is charged on the actual area irrigated, which is measured up before the end of the season.

11. In the Deccan and Southern Mahratta Country I have never heard of damage of any kind resulting from irrigation.

12. (1) A statement (Appendix C) is appended showing the sources from which the canals in the Southern Division derive their supply.

(2) Water is taken from the main or branch canal by means of outlets which are often simple iron pipes fitted with wooden plugs.

15. The canal irrigation is not ordinarily supplemented by irrigation from wells, but wells are often found along the irrigated tract, and in years of scarcity they are used to supplement canal water. In fact, when the area for which water applications are received exceeds that for which the supply suffices, preference would be given to those applicants who have wells in their land and whose crops, therefore, are practically certain not to fail.

17. (3) The water-rates paid on the canals in the Southern Division for various kinds of crops are shown in Appendix B. Payment is made on the actual area irrigated.

(4) No payment is made in the form of royalty.

19. I have never seen or heard of any damage resulting from irrigation in the Deccan. The nature of the country is such that the water drains away without difficulty.

20. Provision is made for maintenance in estimates sanctioned annually. The average cost per acre irrigated during the year 1900-1901 is given in Appendix D.

22. I do not think canals could be constructed by private persons in this part of the country. The original cost would be far too heavy and the profits far too small.

23. (1) All tanks are supplied with water brought down during the monsoon by the nalas across which dams are thrown.

(2) In most cases water is passed through an outlet into a canal which traverses the country and from which it is let out on to the irrigated lands through small outlets which are generally pipes fitted with wooden plugs. In the case of the Yerla river irrigation system, water is let through outlets into the nala and picked up lower down by means of a masonry weir and thence along canal to the irrigated lands.

(4) The area irrigated in 1900-1901 from the various tanks is shown in Appendix D.

26. Irrigation is not ordinarily supplemented by water from wells.

28. (1) and (2) No tanks are owned by private persons.

(3) The water-rates which are paid on the area actually irrigated are shown in Appendix B.

30. On Government tanks provision is made for maintenance in estimates sanctioned annually. The incidence of the cost of maintenance per acre irrigated in 1900-1901 is shown in Appendix D.

31. No tanks belong to private individuals. The second class irrigation tanks are managed and maintained by the cultivators. These cultivators pay a consolidated assessment (for water and land combined) direct to Government.

32. I do not think private persons are in a position to construct irrigation tanks. It is doubtful if the realizations would pay such interest on the sum required for land compensation alone as private capitalists would look for.

33. The time has not yet come when the silting of tanks has caused much inconvenience. In the case of the Maini Tank, however, the bed has silted up to 14 feet above the outlet, the total accumulation of silt being estimated to be 29,824,560 cubic feet. It has already been found necessary to raise the dam and waste weir to compensate for the diminution of storage capacity. This tank was constructed as lately as 1873.

Mr.
Cameron.
13 Jan. 02.

APPENDIX A.

Statement showing the rainfall at the head-quarter stations of—

Belgaum.

Mr.
Cameron.
13 Jan. 02.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.	In. cts.
1891	0 34	0 9	0 18	1 80	1 15	0 50	19 2	11 64	1 24	5 82	1 24	0 32
1892	4 23	3 57	6 76	17 19	8 89	10 4	11 99	1 34	...
1893	0 6	1 99	7 53	11 10	3 51	8 78	4 77	7 5	4 88	...
1894	0 35	1 79	0 52	1 14	9 42	21 78	6 78	1 69	3 71	1 1	...
1895	0 17	0 45	2 76	0 31	8 90	10 32	9 94	4 66	7 23	2 35	...
1896	0 4	2 49	2 13	16 24	21 97	15 18	1 33	1 73	1 2	1 57
1897	1 46	4 54	5 89	14 76	11 14	4 93	2 56	...	...
1898	0 5	1 53	3 45	3 34	9 30	16 49	3 0	10 45	3 89	1 2	0 27
1899	0 15	3 22	0 90	9 15	4 11	1 88	8 1	1 21	...	...
1900	1 36	1 15	10 82	20 29	24 71	0 88	4 26	0 3	...
Average	0 34	0 16	0 60	2 33	2 57	8 81	14 94	10 19	4 80	4 94	1 61	0 72

Dharwar.

1891 . . . . .	...	0 13	1 1	2 60	5 11	0 77	6 41	4 17	0 18	7 7	0 39	...
1892 . . . . .	...	0 17	...	2 51	2 58	3 48	7 62	5 90	6 24	8 44	0 32	...
1893 . . . . .	...	...	0 35	1 98	7 41	4 63	1 59	5 14	1 29	7 96	1 99	...
1894 . . . . .	...	...	0 87	2 95	3 77	3 8	6 90	2 74	1 30	4 15	0 5	...
1895 . . . . .	...	...	0 1	1 14	1 71	6 16	3 58	3 83	6 82	6 45	0 15	0 3
1896 . . . . .	...	...	0 21	1 78	2 66	9 59	11 59	6 13	2 73	3 24	1 22	0 49
1897 . . . . .	...	...	...	2 48	4 0	9 13	5 14	5 79	9 2	5 68	...	...
1898 . . . . .	...	0 43	1 50	2 37	3 39	6 63	8 30	1 32	9 36	6 42	2 5	0 13
1899 . . . . .	...	...	0 95	3 4	1 55	4 73	2 53	0 88	6 28	3 30	...	...
1900 . . . . .	...	...	...	2 74	5 10	6 30	6 83	7 14	1 50	1 60	...	...
Average . . . . .	...	0 24	0 70	2 35	3 73	5 45	6 05	4 30	4 47	5 43	0 88	0 22

Satara.

1891 . . . . .	...	0 49	...	0 32	0 40	1 11	19 66	8 16	1 2	4 84	0 30	...
1892 . . . . .	...	...	...	0 27	3 93	5 8	14 50	4 64	5 73	8 62	0 70	...
1893 . . . . .	...	...	0 8	1 2	3 58	16 76	4 28	7 25	3 20	6 91	0 88	...
1894 . . . . .	...	1 6	0 62	1 15	2 38	7 96	23 91	7 71	2 23	3 26	...	...
1895 . . . . .	...	...	...	0 10	0 16	5 68	6 96	7 29	4 36	11 51	1 6	...
1896 . . . . .	...	...	...	0 66	1 30	12 96	20 57	14 21	0 46	0 28	0 39	...
1897 . . . . .	...	...	...	0 69	2 45	7 73	13 4	10 38	5 20	7 12	...	...
1898 . . . . .	...	0 30	0 26	2 80	0 86	7 95	10 87	3 50	5 57	3 61	0 10	0 15
1899 . . . . .	...	...	...	3 90	0 36	5 37	3 24	1 95	4 81	0 71	...	...
1900 . . . . .	...	...	0 10	1 82	...	4 65	14 49	18 69	1 15	1 95	0 62	...
Average . . . . .	...	0 61	0 26	1 27	1 71	7 52	13 15	8 38	3 37	4 88	0 58	0 15

Bijapur.

1891	0 5	0 86	0 81	1 14	0 64	2 38	0 70	2 81	2 21	1 76	0 34	...
1892 . . . . .	...	...	...	0 78	1 26	7 92	3 94	5 43	5 13	8 94	1 97	...
1893 . . . . .	...	...	2 48	0 55	3 40	3 7	2 47	2 3	5 57	7 72	1 66	...
1894 . . . . .	...	...	0 85	0 62	0 57	2 28	1 61	5 70	10 47	3 0	0 1	...
1895 . . . . .	...	0 3	...	0 30	3 44	2 37	4 27	1 3	14 88	2 98	1 6	0 2
1896	0 1	...	...	0 57	1 89	2 3	1 95	1 40	1 13	0 11	1 60	0 34
1897 . . . . .	...	...	...	1 16	2 7	8 99	1 91	1 6	8 2	5 26	...	...
1898 . . . . .	...	0 35	0 22	1 55	0 78	3 24	1 68	1 21	7 38	6 72	2 95	...
1899 . . . . .	...	...	0 29	1 24	1 44	2 35	0 24	2 93	10 58	...	...	...
1900 . . . . .	...	...	0 11	1 18	0 66	3 97	4 50	0 53	1 34	1 4	0 41	...
Average	0 3	0 41	0 79	0 91	1 61	3 86	2 33	2 41	6 67	4 17	1 25	0 18

APPENDIX B.

Statement showing the water-rates per acre in force during 1900-1901 on Irrigation Works in the Southern Division.

No.	Names of Works.	WATER-RATES.							Occupier's rate.	Owner's rate.	Water advantage.	REMARKS.
		Class I.	Class II.	Class III.	Class III A.	Class IV.	Class V.					
		Perennial.	Eight months.	Four months.	Superior Rabi crops.	Monsoon dry.	Special hot weather.					
1	2	3	4	5	6	7	8	9	10	11	12	
11	Canals.											
	Krishna Canal	25	5 0 0	3 0 0	...	1 0 0	Rs a. p.	As detailed under water-rates.	Nil.	Nil.		(a) From 15th June to 15th February.
25	Ravari Canal	20	5 0 0	3 0 0	...	1 0 0	8 0 0	.....	Nil.	Nil.		(b) From 15th October to 15th June.
28	Chikhi Canal	20	4 0 0	2 0 0	...	1 0 0	8 0 0	.....	...	...		(c) From 15th June to 15th October, or 15th July to end of November.
39	Gokak Canal, 1st Section, and Storage Works.	20	a 5 0 0 b 7 0 0	c 2 0 0 d 3 0 0	...	1 0 0	8 0 0	.....	...	...		(d) From 15th October to 15th February.
26	Tanks.											
27	Upper Man River Works	18	4 0 0	2 0 0	...	1 0 0	8 0 0	.....	...	...		(a) From 15th June to 15th October.
29	Yerla River Irrigation Works	18	4 0 0	2 0 0	...	1 0 0	8 0 0	.....	...	...		(b) " 15th October to 15th February.
30	Maini Tank	18	4 0 0	2 0 0	...	1 0 0	8 0 0	.....	...	...		(c) From 15th June to 15th October, or 15th July to end of November.
	Muchkundi Tank	8	4 0 0	2 0 0	...	1 0 0	4 0 0	.....	...	...		(d) From 15th October to 15th February.
33	Dambal Tank	10	4 0 0	2 0 0	...	0 8 0	4 0 0	.....	...	...		(a) From 15th June to 15th October.
			4 0 0	2 0 0	...			.....	...	...		(b) " 15th October to 15th February.
34	Medleri Tank	14	4 0 0	2 0 0	...	1 0 0	6 0 0	.....	...	...		(c) From 15th June to 15th October, or 15th July to end of November.
			4 0 0	2 0 0	...			.....	...	...		(d) From 15th October to 15th February.
35	Madag Tank	10	4 0 0	2 0 0	...	0 8 0	4 0 0	.....	...	...		(a) From 15th June to 15th February.
			4 0 0	2 0 0	...			.....	...	...		(b) " 15th October to 15th June.
36	Asundi Tank	14	4 0 0	2 0 0	...	1 0 0	6 0 0		(c) From 15th October to 15th June, or 1st August to end of March.
			4 0 0	2 0 0		(d) From 15th February to 15th June.

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APPENDIX C.

Statement showing the sources from which the Canals and Tanks in the Southern Division derive their supply.

District.	Canal and Tank.	Source of supply.	REMARKS.
Canals. Satara.	Krishna Canal.	River Krishna and rainfall.	
	Rewadi do.	River Warna and rainfall.	
	Chikhli do.	River Nandni and rainfall.	
Belgaum.	Gokak Canal.	River Ghatprabha and Storage Works.	
Tanks. Satara.	Upper Man River Works (Pingle Tank) Yerla River Irrigation Works (Nehr Tank) Maini Tank.	Man River and rainfall. Yerla River and rainfall. Wanga Nala and rainfall.	
	Muchkundi Tank.	Muchkundi Nala and rainfall.	
Bijapur.	Gadikeri Tank.	Rainfall.	
	Gokak Canal, 1st Section, and Storage Works.	Ghatprabha River.	
Dharwar.	Dambal Tank.	Rainfall.	
	Medleri Tank.	Medleri Nala and rainfall.	
	Madag Tank.	Kumudwati River and rainfall.	
	Asundi Tank.	Rainfall.	
	Mavinkop Tank.	Rainfall.	

APPENDIX D.

Total Area irrigated and average cost per acre irrigated during 1900-1901.

Name of Work.	Area irrigated during the year.	Per acre irrigated.	REMARKS.
Canals.		Acres.	Bs.
Krishna Canal.	8,288	1.59	
Rewari Canal.	717	3.21	
Chikhli Canal.	537	3.43	
Gokak Canal, 1st Section, and Storage Works.	10,508	0.80	
Tanks.			
Upper Man River Works.	888	21.64	
Yerla River Irrigation Works.	3,551	10.70	
Maini Tank.	1,415	2.07	
Muchkundi Tank.	77	3.67	
Gadikeri Tank.	337*	0.01	
Dambal Tank.	298	3.42	
Medleri.	144*	2.13	
Madag.	106	6.15	
Asundi.	827	1.66	
Mavinkop.	163	19.48	
	185*	9.12	
	540*	0.88	

* Area on which consolidated assessment is levied.

1. Q. (The President.) How long have you been Superintending Engineer of the Southern Division?—For the last ten months.

2. Q. Where were you before that?—I was Executive Engineer, Nasik. I was re-called from leave for famine work. I was also for a short time in Kathiawar, and before that Executive Engineer of Dharwar in charge of roads and buildings.

3. Q. You have had a good deal of experience of the Deccan altogether?—Yes, a fair experience.

4. Q. You say, "As a rule, the people are content with the crops grown naturally; and if rains are good, the difference in value between irrigated crops and those of the same kind grown on the rainfall does not appear to be sufficiently great to cover the cost of the water supplied and other expenses incidental on irrigation." Would it be worth lowering the irrigation rates: would it make any difference?—No; I do not think so.

5. Q. You say, "The canal irrigation is not ordinarily supplemented by irrigation from wells, but wells are often found along the irrigated tract; and in years of scarcity they are used to supplement canal water?"—I was referring to Nasik.

6. Q. Where there are several wells, and an application is made for water, would you give preference to the man owning these wells or would you give it to the man who has no wells?—I would ordinarily give preference to men owning wells.

7. Q. On the Nira Canal, where a certain amount of water has to be conserved, the Irrigation Department supplies water up to a certain date; and the cultivators have to use their wells after that?—The system of stopping of water, at a certain date, and making people use wells after that, may be feasible in Poona and Khandesh, but not here.

8. Q. Do you think that in some places such a process would kill cane cultivation altogether?—No, I don't think it would; the people don't mind accepting a certain of risk.

9. Q. In Appendix D of your printed memorandum there are some startling differences between cases of canal and tank irrigation. The highest average cost per acre irrigated under canals is for Chikhli Canal Rs. 3.43; and the highest for tank is on the upper Man River works, where the average cost per acre irrigated is Rs. 21.64?—On the Man River works heavy expenditure was incurred in constructing a berm, by famine labour, to the Pingle tank dam. On the Yerla River works, a large outlay was incurred in strengthening, also by famine labour, the Nehr tank dam.

10. Q. I suppose the large cost per acre on the Asundi tank was due to the same cause?—Yes; to unusually heavy expenditure.

11. Q. We have had very little information yet about the Satara district. Mr. Beale in his report quotes the views of Mr. Atkins, Collector of Satara, who says: "the Man taluka is most in need of protective irrigation, but new schemes would interfere with the water-supply to the Mhaswad tank, which irrigates lands in Sholapur." Are there in Satara many likely places for Ghat storage?—Yes; I think there are places where very fine storage tanks might be made on the Koyna River, but no definite information is available.

12. Q. (Mr. Muir-Mackenzie.) Would that be a part of the Krishna Canal scheme?—The Krishna Canal weir is some little distance above the junction of the Krishna and Koyna Rivers. I would like to see first of all whether we can bring the water above the weir from the Koyna River at a moderate cost.

13. Q. Is the Krishna Canal capable of extension?—Yes, the original project was for 35 miles; we can extend it by ten miles, which will bring 10,000 more acres under command.

14. Q. You are not certain about the levels of this Koyna scheme?—The last thing done was that levels were ordered to be taken, but they have not been sent in yet.

15. Q. Where was the bund to be?—That was not settled, but somewhere near Halwak there would be a good site. The sites further east might have better catchments; but a large amount of land would be submerged, and as you go lower down, the land gets more valuable.

16. Q. What force is there in Mr. Atkins' remarks that the new schemes would interfere with the Mhaswad tank?—The Jashi tank would cut off 140 square miles from the catchment area of the Mhaswad tank.

17. Q. This is one of the proposed tanks which would deprive the Mhaswad tank of its water-supply. It forms an important part of the Mhaswad basin?—Yes.

18. Q. Probably it might be a good plan to store water for the sake of the Mhaswad tank if it was certain to be utilized?—The Mhaswad water may possibly be fully used later on. I cannot say how often the tank would have overflowed, as the dam began slipping, and the waste weir was cut down. The weir so cut down has overflowed several times. If it had not been cut down, I am not prepared to say if water would have gone over.

19. Q. Was the dam shaky?—It began to slip.

20. Q. I suppose it has been all right since?—Yes.

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21. Q. Is the tank in Sholapur or Satara?—The bund and tank are in the Satara district.

22. Q. (*The President*)—The Krishna River is, I understand, so much below the level of the country that it is difficult to utilize it?—As you go down east, the fall of the Krishna River becomes smaller and smaller. Above Karad the fall is, I think, only $2\frac{1}{2}$ feet per mile, opposite Satara $4\frac{1}{2}$ feet, but in Bijapur it is 6 to 12 inches per mile. There is not much to be expected from it. The banks are 20 to 40 feet high.

23. Q. Would you encourage *bandharas* on the Krishna? Is there any flat ground near the river, or in the valley itself?—*Bandharas* on the Krishna might be made in the Satara district or just outside the limits of it. A large body of water could be let out, but it would have to be a great weir, 500 or 600 feet long.

24. Q. What would be the height?—20 to 30 feet.

25. Q. That would make a fair size tank in the bed of the river?—Yes.

26. Q. Turning to Bijapur, that unhappy place, which suffers a great deal from famine, what can be done for it in the way of irrigation?—One good thing would be the extension of the Gokak Canal. Personally I am interested in seeing that scheme carried out. It has a better chance in my opinion than any other canal in this part of the country. It travels along the left bank of the Ghatprabha River, and a very large area will be brought under its command.

27. Q. What is the soil?—I have not seen the soil; but it is said to be black but not very heavy.

28. Q. Do you say, with certainty, that the people would take water?—I should say so. It is an arid tract; and I quite believe, with the experience of recent drought that the people would gladly take the water.

29. Q. Why is not more water taken on the Krishna?—On the Krishna Canal all the water is utilized in irrigation and the only bar to the extension of irrigation is the want of water in the river. If the supply were sufficient, 25 per cent. of the area under command would probably be irrigated annually.

30. Q. What is it that limits the demand on the Krishna Canal? Is it want of water or want of intelligence on the part of the people?—In the ordinary years there is no water; last year we had had an appreciable increase, the figures jumping from 4,000 to 8,288 acres.

31. Q. You say the Koyna Canal from the Krishna might be too low: in that case what would you do with the water?—We could pick up water from the Koyna storage lower down on the Krishna, opposite Tasgaon, for example.

32. Q. I think Mr. FitzGibbons said that the Gokak Canal will carry 458 feet per second?—The raising of the weir of the Gokak Canal by shutters will only provide enough water for the mills.

33. Q. Is 458 feet per second the maximum available from the catchment?—No. This is the quantity that could probably be safely stored. If the canal were increased in size, more water could be let out in the monsoon without increasing the storage.

34. Q. Do you think it is worth it, why stop at 458 feet per second, when you can get 900?—That would involve a very heavy expenditure.

35. Q. The extension of the Gokak Canal is estimated at 91 lakhs of rupees?—That is an enormous sum to be spent in one particular part of the country.

36. Q. We have had evidence that in Bijapur people are not keen on water. Mr. Beale makes some remarks on the Muchkundi tank on page 301 of his reports; coming to this district, is there any chance of the Magad tank extension being carried out. Have you gone into the question at all?—The dam of the Magad tank is enormous; the pitching is of 3 feet cube blocks; and everything is on a gigantic scale. The original idea was that the water level would have been 100 feet higher than it is at present.

37. Q. What is the land under it like?—It is cultivated land, and the Mysore Government may refuse to part with the land that would be submerged if the waste weir were raised.

38. Q. It struck me from Mr. Beale's map that the canal winds about; but never gets into the famine district?—Not much of the district is affected by famine, only 10 per cent. of the villagers came to relief works.

39. Q. If it amounts to a question of locking up water in a country which does not want it, we ought to store it in the Madag, and let it feed the Tungabhadra River, and become a Madras scheme?—One of the projects proposed for the Tungabhadra is for a canal from Hesarur to Bellary? A suitable site for a weir could probably be found near Hesarur but the canal from it would not benefit lands in the Bombay Presidency.

40. Q. Are there any profitable Ghat projects?—No, I know of none in Dharwar. There is a place suitable for a tank at Menndi near the Dambal tank, where Mr. Shirbatti says the people are very anxious for irrigation.

41. Q. In paragraph 33 of your memorandum you say:—"The time has not yet come when the silting of tanks has caused much inconvenience. In the case of the Maini tank, however, the bed has silted up to 14 feet above the outlet, the total accumulation of silt being estimated to be 29,824,560 cubic feet. It has already been found necessary to raise the dam and waste weir to compensate for the diminution of storage capacity. This tank was constructed as lately as 1870." Is there some inherent difficulty about that tank?—There is all black soil in the catchment and I have noticed that small village tanks in black soil get silted up rapidly.

42. Q. Why does the black soil silt up more easily than any other?—In cultivated black soil the fields are bare of jungle and grass and silt is, therefore, more easily produced, when there is a wash down.

43. Q. It is moved more easily?—Yes.

44. Q. As a matter of fact, is a black soil stream or flood more muddy than other streams?—It looks extremely muddy.

45. Q. Would you advocate the making of sluices as a precaution against silting?—For big works like the Gokak Storage Works, I should strongly recommend large sluices.

46. Q. I suppose you do not believe that clearing silt from tanks can be carried out economically?—No clearance of silt by labour can be economical.

47. Q. (*Mr. Higham*).—With regard to the Satara district what proposals are there for increasing the storage of the Krishna?—There was a proposal for a tank at Ambavadi.

48. Q. That has been abandoned?—Yes. Then there was the Tarla scheme. General Goodfellow reported in 1889 against the scheme which Colonel Le Mesurier had recommended in 1885. Colonel Le Mesurier, while drawing attention to the risks attending the construction of lofty earthen dams, reported in favour of the scheme which according to his figures would yield a revenue of $8\frac{1}{2}$ per cent. on the direct outlay. In 1888 General Goodfellow reported strongly against the scheme, drawing attention to the remarks by Colonel Le Mesurier that there was a great risk attending any dam over 50 to 60 feet high. The dam was to be an earthen one 95 feet high. He pointed out that the only feasible dam would be a masonry one and gave certain figures which showed that the profits under those circumstances would be very small. He also drew attention to the fact that the distance from Tarla to the Khodshi weir would be 20 miles, so that there would be heavy loss from evaporation and absorption.

49. Q. The estimate of the total loss was 420 million cubic feet?—Yes.

50. Q. The Krishna Canal weir is in the bed of the river, is it not?—Yes.

51. Q. What happened after that, was the work commenced?—No work was done. In 1895 Mr. Strange reported that it would be better to give up the Tarla scheme and build a series of weirs above Khodshi in the shape of bridges with openings of 30 or 40 feet span with baulks or gates in the openings through which water could be gradually let down the Krishna. One site is at Mahuli, another at Gajgaon, and another at Bharampuri. The weirs were to be built at the rapids so as to make use of the fall which is about 10 feet.

52. Q. Could you get the water away from there?—At Bharampuri there is room for a small canal on the right bank.

53. Q. The idea is to have a series of weirs each storing a small quantity of water?—Yes.

54. Q. What would be the aggregate storage?—It has not been calculated.

55. Q. Where would the water be utilized?—In the Krishna Canal.

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56. Q. How much would this storage increase the Krishna Canal supply?—The quantity has not been calculated. It will not exceed one thousand million cubic feet.

57. Q. Is that all you want?—Yes, that would be ample.

58. Q. What could you do with that?—We could extend the present canal by ten miles. With plenty of storage, we could have a long left bank canal.

59. Q. Is that the only proposal put forward so far?—Yes.

60. Q. Is there any chance of a canal, taking off the Krishna, going out to the Athni taluka?—It would have to be very long; and we might not get enough of water for it.

61. Q. Has it ever been surveyed?—No, it would have to be a very long canal and very expensive owing to the large masonry works that would be necessary, as it would have to be carried right across the tributaries of the Krishna.

62. Q. And you would also require heavy storage works to get the water, the only storage project so far being that proposed by Mr. Strange?—There is one for the Koyna. The Koyna is a large river with a catchment in the Ghats. It would be practically certain to fill.

63. Q. Have they any plans of that?—The Executive Engineer reported that levels were being taken, but famine came upon us and no progress was made.

64. Q. Are there any sites?—I am certain that sites can be found on the Koyna.

65. Q. Has the Tarja scheme been shelved?—Yes, it has practically been abandoned.

66. Q. Is there any other project you would like to recommend being completed for the Satara district apart from those?—No.

67. Q. Can any of these works be begun as famine works?—The works on the Krishna would be masonry which is unsuited for famine labour. Part of the dam for a storage tank on the Koyna might be of earth on which famine labour could be employed.

68. Q. How far has the Goregaon tank progressed?—The puddle trench has been excavated, and the subsoil known locally as "Shadu" (a material which chemical analyzer has shown to contain 4 per cent. of salt) has been removed and the excavation partly filled in.

69. Q. Only a small sum has been spent, compared to the cost. The total expenditure of the September last was Rs. 1,85,000?—That is famine expenditure; the normal expenditure would be Rs. 1,50,000.

70. Q. In regard to Sangogi and Hullur, what is proposed?—Large storage tanks are to be formed from which water is to be let out for irrigation. With the experience of Bijapur, I do not recommend the Sangogi tank. The people do not appear to be desirous of irrigation, and 6,000 acres would be submerged and thrown out of cultivation on the chance of supplying water to another area. It is a serious thing to permanently throw out of cultivation a large area of land when there is no waste land to give out in exchange.

71. Q. The Collector of Bijapur has recommended that the work should be completed?—I believe the Collector has said that the soil on the two sides of the Krishna is very different and that, while on one side the people will not take water, on the other they will.

72. Q. Do you think it is doubtful, whether the people will take the water if they could get it?—I think it would be a very doubtful experiment. It would submerge 6,000 acres, and there is no land to give in exchange except in forest lands.

73. Q. Similar conditions apply to Hullur?—Yes, but that is a smaller work.

74. Q. Have you ever considered the question of irrigating in the Kolhapur State?—No. It will have to be irrigated by the Krishna or one of its tributaries?—Yes, if we carry out the Koyna scheme for storage, and if it be feasible to construct a canal to irrigate lands in the Athni taluka of the Belgaum district, the pick-up weir will be in Satara and the water will pass through Kolhapur.

75. Q. You were a long time in Sind?—Yes, I was ten years in Sind.

76. Q. In Sind the water is given to the cultivators to take as they please?—Yes.

77. Q. There is no application necessary?—No.

78. Q. Do you think that the present rules, in regard to application in this Presidency might be relaxed?—I

don't see how they can be relaxed. It is different in Sind, where without irrigation there is no crop. Here there is irrigation to a small extent; and at times there is scarcity of water, so that it is absolutely necessary for the irrigation officers to know what the demand is going to be. If the people were allowed to take water as they liked from the tank, all the water would be drawn off at once, and all the crops would perish for want of water, when required most. I have known during the famine in Nasik, people come to me and beg me to give them water, offering to pay, even, if the crop failed. But, if I had complied with their request, their crops would have failed, and, in addition, the people whose applications had already been accepted would have suffered.

79. Q. But that would not apply to the monsoon?—No, not when the water is running to waste; but applications are also necessary to check frauds. The rule is that all applications for monsoon crops should be received before the 15th July.

80. Q. Might it not be possible that a man might want water after that date, who had no intention of taking it before?—It would lie with the Executive Engineer to charge him double rate, if water were taken without permission, and if he had reason to believe that the man intended to try to avoid payment. The matter is left to the discretion of the Executive Engineer.

81. Q. When you make a rule that double rate is to be charged, the Canal Officer is likely to charge it?—Yes, but the cultivators are aware of the penalty.

82. Q. Is there any objection to a man's taking water in the monsoon without application?—No, except for the chance of fraud.

83. Q. Would you penalize them?—As far as I am concerned, if the man had sent an application, I would not, when there is plenty of water, penalize him. I would only penalize for attempts to conceal irrigation.

84. Q. But what do your Executive Engineers generally do?—Some Executive Engineers would penalize them.

85. Q. I suppose every body knows that rule?—Yes.

86. Q. Have you considered the question of irrigation in Kathiawar?—No; I was only in Kathiawar for three weeks.

87. Q. As regards the question of wells for sugarcane you say the people don't mind accepting a certain amount of risk. Do you mean that they don't take the trouble to make wells to ensure a great risk?—I mean even without a well they grow sugarcane even when there might be some risk of the crops failing.

88. Q. Even, if they understood, the water would not be guaranteed?—Yes.

89. Q. If we refused to supply water, after a certain date, would not that deter them from growing cane?—On new canals it might. They would begin cane-growing very slowly at first, and if they found the water failed, they would stop planting sugarcane, and other people would be choked off.

90. Q. On the Rewari Canal, is the supply perennial?—I think it generally flows all the year round.

91. Q. That is a small canal?—Yes, it irrigates only 162 acres.

92. Q. You say that on second class irrigation works the cultivators jealously guard their rights. Do you think if water from first class works was parcelled out to the villagers as a whole, that they would be equal to controlling the distribution among themselves?—The villagers, I fear, could not control the water for first class works. On second class works the custom which was in force a hundred years ago is in vogue, but on first class works the people under them would not know what to do with the water.

93. Q. I suppose it has never been tried?—No.

94. Q. Suppose you were to give each village water-course a definite supply every ten days and told them to divide it among themselves, would they not be able to do so?—That would mean changing the assessment to consolidated rates.

95. Q. Suppose you try it where you have crop rates? Where we have crop rates the areas irrigated are usually small and scattered—mere specks in the midst of unirrigated fields, and I do not think there could be any combination among the irrigators. But on the small second class irrigation tanks the case is different. All the land under them that can be irrigated is assessed at consolidated rates, and the owners are required to pay the assessment whether they

take water or not, and consequently each man asserts his right to his share of the water.

96. Q. I would give the water out in blocks?—In ordinary years the people don't want water for dry crops and they won't take it.

97. Q. (Mr. Ibbotson).—You say in paragraph 3 of your memorandum that there are large tracts of black cotton soil which cannot be irrigated, and that there are tracts that can be irrigated. You don't mean that all cannot be irrigated?—No, I was thinking of Belgaum and Dharwar.

98. Q. Outside Belgaum and Dharwar do you know of any soil that cannot be irrigated?—The unirrigable tracts of black soil are those to which we cannot give water.

99. Q. But would the tracts you refer to take water if they could get it?—In the Bijapur district in the part near Bagalkote they would take water I think.

100. Q. Are there any other parts in Bijapur where you think water might be taken?—I don't know about the other parts.

101. Q. Do you know what conditions determine whether water is taken or not?—It is perhaps a question of soil.

102. Q. You say in a famine year the water in all the tanks is less than the demand, but that in ordinary years all the water is not taken owing to the uncertainty of the supply. If the supply were assured, it is said they would take water for high class crops. Do you believe that?—I don't hold those views. The area under high class crops must be limited, and it is only in years of scarcity when the people can see that there is less water in the tank than usual that they clamour for water.

103. Q. I don't think I have made my point clear. If you could guarantee the supply throughout the season and for every year, men might be induced to go in for high class crops which alone makes irrigation possible in an ordinary year?—I don't think that any doubts about the water-supply prevent people from preparing their lands for high class crops.

104. Q. Then you don't think that changing a precarious into a perennial supply would lead to a great increase of irrigation in ordinary years?—No.

105. Q. That irrigation has increased during the last two or three years is natural, but is there any reason to believe that the increase will be maintained in ordinary years?—I think not. For instance, in 1898-99 the irrigation on the Krishna tank dropped to the old figures.

106. Q. On the Gokak Canal the people use every drop of water they can get?—On the Gokak Canal the people have realized the advantages of irrigation. In other parts in ordinary years crops do well without irrigation.

107. Q. The supply is perennial, but that does not explain the difference of demand on the other canals?—No.

108. Q. About supplemental wells, when a man grows sugarcane under a canal the area is limited by the water in the canal; with well water if he could irrigate his crop throughout the year, is it not a waste of water to give him canal water when he can irrigate from his wells?—The cases I refer to are in the Nasik district, where the wells are silted up and the people take canal water.

109. Q. If the demand is equal to the supply is it not better to give water to the man who has not got a well?—I don't think we ought to penalise a man who has sunk his capital in a well.

110. Q. You don't penalise him. You let him have his well water and give canal water to a man elsewhere who has not got any water?—I would give it to the man who had a well.

111. Q. Why sacrifice protection to the interests of the man who has a well?—If the water in the canal is at all liable to fail, I think that the man with the well should be given the preference.

112. Q. Suppose you had two applicants, one who had a well and another who had not; would you not refuse the man who had the well and give it to the man who had not?—In the case of an ample water-supply I should still give the preference to the man with the well.

113. Q. Taking the Nasik case if you had an ample water-supply would you give it to the man with the well?—Yes.

114. Q. Referring to famine programmes we find in Bijapur they have been living from hand to mouth. You have the districts Belgaum and Dharwar in which famine

has not been very frequent, have you famine programmes ready for these two districts?—Yes.

115. Q. How were these prepared, who was consulted?—The Collector consults with the Executive Engineer and sends in the programme for the approval of the Commissioner and Superintending Engineer.

116. Q. Are current Public Works Department works included. That is supposing you were going to make a new road presently, you would not put that in the famine programme?—Current works are not included in the famine programme unless they are works which are not likely to be carried out at once from ordinary funds.

117. Q. As a matter of fact they are not included?—Yes.

118. Q. There is nothing to show how you arrive at the numbers of unskilled famine labourers?—We calculate the probable numbers likely to go on relief works by previous famines.

119. Q. When you have the actual figures of a severe and recent famine, don't you think the actuals should be included in your statement?—Yes, I think the actual figures of the last famine should be shown on the famine relief works programme which provides for six months.

120. Q. Have you a map showing these works?—Yes, one was sent to the Collector.

121. Q. In the case of large works on the borders of the district which would probably attract labour from the neighbouring districts, do you make any allowance for that?—No, we make no allowance for immigrants.

122. Q. Is there a separate list for Civil Agency Works?—Yes, the Collector prepares that.

123. Q. Supposing the Collector puts down repairs to tanks, is there anything to ensure that the best possible work has been selected?—As a rule the repairs to tanks are generally clearance of drinking tanks.

124. Q. Is no survey or projects required for these?—No.

125. Q. Are there no works of that sort in your programmes?—No. On works such as field embankments some levelling is necessary.

126. Q. Are there any sites in your district where new irrigation tanks could be made profitably?—There are sites possibly for small tanks to impound water.

127. Q. Could not money be profitably spent on such works?—Yes, I think so.

128. Q. You have not been consulted as to the list of Civil Works?—No.

129. Q. Would it not be better if both lists passed through your hands?—They do pass through my hands. But it is difficult for me to give an opinion as to what small works should be taken in hand.

130. Q. You have not had a survey made?—No.

131. Q. Would it cost much?—It would require a very large establishment for a general survey and would take a great many years to complete.

132. Q. Could you examine certain sites only?—It would take a much smaller establishment if the Mamlatdars could tell us first what tanks require repairs.

133. Q. Do you think their information would be counted much?—Yes.

134. Q. Could you safely leave it in their hands?—Yes, they could be trusted to do this.

135. Q. As regards the larger works entered in the list, are the projects ready?—No, many of the projects are not ready.

136. Q. And so if famine came, you would be unprepared to some extent?—Yes.

137. Q. Could you get these projects ready in the ordinary course during the last 18 months with any extra establishment?—Yes.

138. Q. (Mr. Rajaratna Malr.)—You said that under existing circumstances it is impossible to abolish the application system; could you not make a settlement with the *ragats* for five years based on the average of the previous five years and regulate your supply accordingly, letting the villagers decide how much area each man will take up?—I don't think the Government would like the Executive Engineer to guarantee water for five years in advance. Besides a man would say he did not know what crops he was going to grow in the next five years.

Mr.
Cameron.
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Mr. Cameron. 139. Q. You will still charge crop rates but fix the area and guarantee the supply?—I don't think it will work.

13 Jan. 02. 140. Q. You say to each *rayat* you have been irrigating 3 acres of garden crop and sugarcane we will make a permanent arrangement to supply you with water and charge you accordingly?—It would be a long process, if we had to consult each landowner.

141. Q. You have to do that now every year, under the present canal system?—No, we do not ask them; they apply to us.

142. Q. Mr. Viavesvaraya has made some such proposal. You take the water in the tank in the worst famine year as a basis and guarantee one-third of the supply; would you care to try that in the Gokak Canal?—At Gokak the people are only too eager for water, so that I don't understand what the object of that would be.

143. Q. You practically introduce a consolidated rate. You get a fixed revenue and all bother about applications is abolished. I am speaking of canals of unlimited supply?—The Gokak Canal supply can fail. It did so in 1900 for seven weeks.

144. Q. How does the system of application enable you to prevent frauds?—The canal authority reports the date of the first watering.

145. Q. If the application was not put in, and the Canal Officer was giving water?—The fraud would be detected by the supervisor; and there is a penalty for taking water without leave.

146. Q. Then you don't think that application should be abolished?—No. I don't think that the application on the printed form deters people from taking water.

147. Q. Mr. Whiting told us that the Patkaris often favour people?—I have not come across such instances; but I don't mean to say that the canal establishment is immaculate.

148. Q. With regard to supplemental wells, in connection with tanks of uncertain supply, do you think that if the canal rates were reduced by $\frac{1}{2}$, in regard to those people who had wells, would the number of wells increase?—I do not know; but we might reduce the rates on the condition that a well would be sunk.

149. Q. If additional *takavi* were granted, would the *rayats* be induced to sink supplemental wells?—Yes; I think they would.

150. Q. The Deputy Collector has told us that, if the Gokak Canal could be carried across a certain *na la*, it would irrigate a large area of dry land?—Yes, an enormous area.

151. Q. What would be the cost of that work?—I cannot tell you what the cost of an aqueduct over the Nallah would be, as I have not the figures with me here.

152. Q. The Deputy Collector thought that people want water largely for the *khari* crop?—In the monsoon we could give any amount of water.

153. Q. It could be carried out without waiting for the big scheme?—It will be investigated shortly; but, I believe, that it can be carried out without waiting for the bigger scheme.

154. Q. I believe the stream is two furlongs wide?—Four hundred and forty yards would represent a very wide stream; and the scheme will be very expensive.

155. Q. You say that the waste weir of the Mhaswad tank was lowered; to what extent did this reduce the capacity of the tank?—I have not got the papers here; they are in the Sholapur Divisional office. The dam showed signs of failing; and it was cut down.

156. Q. Is there any proposal to raise the weir to its former level?—Yes; this was merely a temporary arrangement.

157. Q. On the Krishna River, is it possible to irrigate any large area, by means of oil engines or steam pumps?—That is a question I cannot answer off-hand; because of the cost of pumping. Whether the scheme is practicable can only be determined after very careful investigation.

158. Q. (Mr. Muir-Mackenzie).—Is it true the cultivators refuse to use the water on account of the sacredness of the river; and that they will not take the water pumped, as it will be touched by profane hands?—I have not heard of that.

159. Q. (Mr. Rajaratna Mdlr).—Certain dates are fixed for application; and we were told that water is not allowed for irrigation before that date? Before the dates fixed, the *rayats* are not allowed to take water.

160. Q. If they asked water for two seasons, they will have to pay crop rates for two seasons?—Yes.

161. Q. Supposing a man applies for *khari* crop early in January, you would not give him water before the 15th June?—No, certainly not, the hot weather supply is most valuable.

162. Q. What are the hot weather rates?—The hot weather rates are as follows:—

On seven works, Rs. 8 per acre.

On two works „ 6 „

On three works „ 4 „

163. Q. (Mr. Muir-Mackenzie).—The Pudukkatti Canal would not go into the famine area?—No, only to the borders.

164. Q. Would it be advisable to start the canal work, in anticipation of the tank being made?—No, I would prefer to see the tank made first, as the canal would be useless without it.

165. Q. If you have the canal complete, you have only to start the tank?—I would rather put in the puddle trench first.

166. Q. But that would be further from the centre of labour?—It would. But I do not think the distance would be objectionally great.

167. Q. You have two sets of eight months' crops?—Yes, it depends on the time, at which the water is taken. The first is up to the 15th January, and the second set is up to the end of February.

168. Q. When must the applications for the first set be received?—Any time before the season ends.

169. Q. By what date are you pledged for the eight months' crop?—At about the end of the monsoon.

170. Q. How far is the Irrigation Department pledged by the area under eight months' crops?—For the eight months' crops water is not pledged beyond February.

171. Q. Is it pledged for a longer time for *rabi* crops?—No.

172. Q. There are large pools of water in the Krishna, can they be utilized?—No.

173. Q. Do you know any sites on the Warna River?—No.

174. Q. I should like to see all these projects thoroughly investigated. You would not recommend the stoppage of the works on the Sangogi and Hullur tanks?—No; I think they are less unprofitable than any alternative.

175. Q. Are you against the employment of famine labour on field embankments?—No. But before they could be undertaken a complete scheme of these field schemes would have to be got out. It then might be possible to make them in groups by famine labour.

Witness No. 87.—Mr. H. F. BEALE, Superintending Engineer on Special Duty with the Irrigation Commission.

Mr. Beale.

19 Jan. 02.

Q., (The President).—We are much obliged to you, Mr. Beale for the valuable help you have given us; and for your carefully prepared report of irrigation works in the Bombay Presidency. It was a great pleasure to have had you associated in our investigations up to the borders of the Madras Presidency.

Mr. Beale.—It has been a great pleasure for me to have given such information as lay in my power; and I should like to add the following few remarks:—

Repairs to 2nd class irrigation works, small tanks.

When the Public Works Department has repaired such tanks there should not be a recurrent annual charge for

maintenance, because Government have ruled in Public Works Department G. R. No. 34 W. 1—419 of 5th March 1895 that all petty repairs shall be carried out by the villagers. The petty repairs are described as “filling in rat-holes, making up banks worn down by cattle traffic, clearing small water courses and similar petty earth work repairs,” and the Revenue Department were directed to issue the necessary instructions in the matter to village officers and Circle Inspectors.

In practice, however, according to the Belgaum Executive Engineer's evidence, the petty repairs are often not done and the Revenue authorities cannot legally enforce

the carrying out of such repairs. Some legislation would, therefore, appear advisable, to secure a reasonable amount of care and attention being paid by the villagers to the upkeep of the small tanks.

B.—Bandharas in various districts.

There are numerous pakka bandharas in Khandesh and Nasik and it is stated (page 149 of the Report for Bombay) that these were constructed and maintained by the Mahomedan Government. Before their construction there were undoubtedly temporary bundharas in their places.

The Bombay Administration Report, 1899-1900, shows that the "other sources" (besides wells and tanks) from which water is drawn for irrigation are as follows:—

Collectorate,	Pakka.	Kacha.
Khandesh	70	37
Nasik	234	244
	<hr/> 304	<hr/> 281
Ahmednagar	20	471
Poona	74	388
Satara	70	5,201
	<hr/>	<hr/>

The proportion between pakka and kacha works of this kind may perhaps be due to the Mahomedan influence having been less strong in the latter districts, and partly also to some difficulty with foundations. But it is probable that in a large number of cases a masonry structure could be substituted for the temporary dams which are erected annually at a cost of Rs. 50 to Rs. 100, and that the area of irrigation could thereby be improved and extended.

C.—Irrigation of high class crops.

I have advocated in the report the encouragement of high class crops under irrigation works: but where it is not possible to increase the water-supply to a canal, by fresh storage reservoirs, I would not recommend the encouragement of such crops to the exclusion of grain and fodder crops. It would, I think be advisable to give water to a "permanent" area of rabi irrigation, that is: to ascertain how much the cultivators will irrigate from year to year, and let this be a first charge on the water. The remainder might be wholly given to perennial and garden crops up to the limit of the assured annual storage. Any excess of water in good years could be made use of as required. By this means a more or less certain area of irrigation might be secured, and the annual variations (except in the case of tanks with very uncertain supply) should be comparatively small.

Mr. Beale.

13 Jan. 02.





सत्यमेव जयते

Supplementary Memoranda, etc.

(1) MR. D. W. HERBERT, Assoc. M. Inst. C.E., Under Secretary to Government, Public Works Department.

*Answers to printed questions.*Mr. D. W.
Herbert.

Preliminary Remarks.—I served as Executive Engineer, Khândesh district, throughout the famine of 1899-1900, but have never been in charge of irrigation works except in Sind, and am therefore not in a position to give much useful evidence.

5. *Provincial Irrigation Works.*—All the irrigation works in the Bombay Presidency, with the exception of the Gokak Storage Works, are financed from Imperial funds. The question of provincializing these works has several times been considered and abandoned. As land revenue is mainly Imperial, it would appear to be appropriate that the expenditure on works, which so greatly affects it, should also be Imperial.

It is believed that the majority of the large irrigation works in the Deccan were constructed either for the purpose of relieving famine or as protective works, and the financial responsibility, for these and for completing the irrigation works commenced as famine relief works, could not, I presume, be undertaken by the Local Government under existing financial arrangements.

7. *Wells.*—Apparently the difficulty of obtaining fodder for the oxen interfered in Khândesh to a certain extent with the usefulness of wells for irrigation purposes during 1900.

10. *Programmes of Relief Works.*—I would recommend, for the Bombay Presidency, that an Executive Engineer with three Assistants and about twenty subordinates be appointed for the purpose of getting up projects for famine

relief works. The above establishment would probably be able to complete a twelve months' programme in about two years at a cost of about one and-a-quarter lakhs per annum. After the completion of a twelve months' programme, the number of assistants and subordinates might be reduced and a further reduction might be made after the completion of a two years' programme. The remaining establishment would be permanently employed for the purpose of maintaining the programmes, revising estimates, inspecting bench marks, rain gauges, tools, etc., and as a reserve in the event of a famine. The Executive Engineer might also prepare a famine manual including complete task tables and ready reckoners; he would, in districts where that difficulty is met with, prepare a list of the places where water is obtainable in years of drought near the proposed works. He would arrange for the supply and distribution of a reserve of tools, and would carefully prepare and keep up to date a list of establishment of all kinds available in the event of a famine.

Khândesh was considered practically immune from famine, and all the arrangements, programme, establishment, tools, etc., were sufficient, before the famine, for about a tenth only of the number that had to be relieved. Anyone who has experienced similar difficulties would be satisfied of the necessity for some such arrangement as proposed above, especially in the Bombay Presidency, where the Public Works Department establishment is short of requirements even in normal times.

(2) MR. H. S. LAWRENCE, I.C.S., Acting Director of Land Records and Agriculture.

MEMORANDUM.

1. The points upon which information is required are detailed in Government Memorandum No. P.-1053, dated 21st September 1901, and the appendix to Government Resolution No. 2275, dated 26th October 1901, and are referred to in the margin of this report.

2. It will be convenient to separate the districts not merely into Gujarât and Deccan, but as shown under, into—

Gujarât.	Deccan.	Karnâtak	Konkan.
Ahmedabad.	Khândesh.	Belgaum.	Thâna.
Kaira.	Nâsik.	Bijapur.	Kolâba.
Panch Mahâls.	Ahmednagar.	Dhârwar.	Ratnâgiri.
Broach.	Poona.	Kânara.	
Surat.	Sholâpur.		
	Sâtârâ.		

3. Up to 1885-1886, irrigated areas were shown under the general heading "Irrigated garden lands on tanks, water-courses, etc." From 1885-86 to 1892-93 they were divided under the headings "Canals" and "Other Sources." From 1892-1893 the following sub-division has been made:—

(1) Government canals, (2) private canals, (3) wells, (4) tanks, and (5) other sources.

This classification is, however, only approximately correct, as when an area is irrigated partly from wells and partly from tanks and canals, it is entered under the head which is the principal source of irrigation.

Table I gives the information available from 1892-93, and an abstract according to agricultural divisions is added in Table II.

Attention is invited to (1), the failure of tank irrigation in 1899-1900, which in Gujarât fell from 14,132 acres in 1898-99 to 693 acres, and in the Karnâtak from 92,355 to 24,480 acres.

(2) The large expansion of well-irrigation, especially in Gujarât, from 93,591 in 1898-99 to 183,216 acres in 1899-1900.

It is to be observed that in 1896-97 the rainfall, though so unseasonable as to cause famine, was not below the average throughout the country, while in 1899-1900 it was

exceedingly deficient. In consequence there was a sufficient supply of water for the Government canals, tanks, and pâts in the first year, but in the second, when the need for protection was still more urgent, these sources proved ineffective. The figures strikingly illustrate the superior value of wells as the most reliable method of protection.

4. The gross and culturable areas in each district and the proportions of the latter which are protected by Government irrigation works, by private or village works and by wells respectively, are entered in Table III.

5. The character of the soil in the various tracts is fully described on pages 20 to 31 of Mr. Mollison's Text Book on Indian Agriculture, Vol. I.

In brief, in Gujarât the soil varies from sand, in Ahmedabad through alluvial loams, in Kaira to the black clay loam of Broach and Surat.

In the Deccan the valleys contain "medium black soil of moderate depth with murrum or trap as the underlying stratum;" the uplands have thin soil of disintegrated trap.

The Karnâtak has clay loams of great natural fertility.

The Konkan has stiff ferruginous clays for rice, light sands for gardens, and poor stony uplands for dry-crops.

6. Nowhere is cultivation solely dependent on artificial irrigation. In all cases such irrigation is in aid of natural rainfall used for the production of more valuable crops.

7. Statistics for ten years as recorded at the head-quarter stations of districts are entered in Table IV. Pages 3 and 4 of the Statistical Atlas of the Presidency, may also be consulted.

Irrigation Commission Memorandum, paragraph 2 (5) and (6). Is there ordinarily a demand for water in Gujarât during south-west monsoon? What are the crops which require irrigation, etc.?

8. No exact information on record.

Mr. H. S.
Lawrence.

Mr. H. S.
Lawrence.

No control is exercised by Government agency over distribution from private or village works. Irrigation from Government canals is controlled by the Irrigation Branch of the Public Works Department.

Irrigation Commission Memorandum, paragraph 2 (8). In what form is irrigation revenue realized?

Complete information should also be collated regarding the assessment and rates on all irrigated and irrigable crops and lands including rice. The principles and incidence of subsoil water assessment should be explained.

Government Memorandum No. P. 1053.

A. The system of assessment on wells was handed down from the Marátha rule, and having been from the earliest days of British rule recognised as a tax on improvements effected by the rayat has been gradually transformed or abolished.

No additional charge whatever is imposed on the construction of a new well.

The system under which the land assessments now in force were imposed varies in different tracts.

In dry and arid districts of the Deccan (such as Indápur and Mádhá) lands found under irrigation from wells at the original settlement and then assessed as garden land were assessed within the maximum dry-crop rate.

Lands under new wells, that is, those constructed during the original settlement, were assessed at the ordinary dry-crop rate.

In the districts of the Deccan and Southern Marátha Country with greater command of subsoil water and where well irrigation was found to have been carried on to an extensive scale, lands with wells, whether old or new, that is, whether existing from a date anterior to the introduction of the original settlement or constructed since, were

classed a little higher on account of command of water and assessed at dry-crop rates, the assessment in no case exceeding the well assessment previously levied.

Act IV of 1886 amending the Land Revenue Code laid down (Section 106) that when a general classification of the soil had been made a second time, or any original classification had been approved by Government as final, no future change of classification should be made. This now covers all cases; the Survey Department has been abolished, and the utilisation of water advantages is entirely free from any risk of future enhancement.

10. In the Gujarát districts a subsoil water rate was substituted for all assessments on wells, in accordance with the following survey rule:—

"Where in any tract in a village which is well defined and of uniform character of soil, the subsoil water is shown by that of the wells existing in it to be of uniform quality, every survey number in the tract, though as yet without a well, shall have its subsoil water classed in the same order as that of the survey numbers which have wells."

No addition was made by this subsoil assessment to the total revenue demand of a village, but when that demand had been determined on general considerations, the subsoil assessment merely increased the share of the total demand imposed on those fields which possessed superior irrigational potentialities.

When the assessment of a field had been calculated according to the method of soil classification peculiar to the Bombay system, a percentage was added which varied according to three factors—the fertility of the soil to be irrigated, the depth at which water was obtainable, and the quality of the water. The percentage varied accordingly from 2 per cent. to 50 per cent. It is impossible to ascertain the incidence of this subsoil water assessment in all cases, but from the figures entered in the subjoined statement, it appears that in representative talukas of the Kaira and Surat districts it amounted to from 3 to 7 per cent. of the ordinary assessment.

District and Taluka.	AREA.		ASSESSMENT.		PERCENTAGE.	
	Of dry-crop and rice land.	Under subsoil assessment.	Of total dry-crop and rice land.	On account of subsoil advantages.	Of subsoil area (column 3), on total area (column 2).	Of subsoil assessment (column 5), on total assessment (column 4).
1	2	3	4	5	6	7
KAIRA.						
	Acres.	Acres.	Rs.	Rs.		
1. Mehmabad	51,700	48,476	2,23,540	11,904	93.7	5.3
2. Anand	61,172	17,996	3,01,530	13,369	29.4	4.4
3. Kapadvanj	80,276	41,975	1,48,150	10,844	52.2	7.3
4. Thasra	69,163	18,404	2,05,736	5,910	26.6	2.8
5. Borsad	49,628	26,347	2,74,596	17,052	53.09	6.2
Total	311,939	153,198	11,53,552	59,079	49.1	5.1
SURAT.						
1. Chorási	26,264	3,943	1,61,925	4,317	15.01	2.6
2. Chikhli	81,753	10,112	2,13,589	6,241	12.3	2.9
3. Olpád	101,648	800	5,06,765	541	0.78	0.1
4. Bárdoli	116,116	9,560	4,65,696	6,059	8.2	1.3
5. Jalálpore	59,876	13,113	3,14,204	14,020	21.9	4.4
6. Bulsár	97,398	13,436	2,57,012	11,340	13.7	4.4
Total	483,055	50,964	19,19,191	42,518	10.5	2.2
GRAND TOTAL	794,994	204,162	30,72,743	1,01,597	25.7	3.3

11B. *Dhekudi* or *Budki* is a pit or well in the bank of a river, nála or tank connected therewith by a channel.

In the Deccan and Southern Marátha Country since 1874 "lands within a certain distance from a stream from which water could be obtained by means of a *budki* were classed at a higher rate and assessed at a rate not exceeding the maximum dry-crop rate in the garden land existing at the time of the last settlement and at the simple dry-crop rate on the land under wells or *budkis* constructed since that settlement."

In the Gujarát districts of Panch Maháls, Ahmedabad and Kaira, subsoil water assessment has been substituted for the special rates formerly obtaining.

In Surat where the rivers do not change their course, and *dhekudis* can, therefore, be made permanent, a percentage addition is made to the assessment of fields within 30 chains of the stream, this addition varying according to the depth to water in the *dhekudi*, and the percnial or seasonal supply of water.

12C. *Tanks*.—Irrigation from tanks takes place on a small scale, except only in the Dhárwár district of the Karnátak, where in 1898-99 some 82,000 acres received it (*vide* Table I). The assistance derived is included in the classification value of each field, so many annas for command of irrigation being added to so many annas for soil fertility, and a consolidated rate is imposed accordingly.

13D. *Canals and channels*.—Pátasthal assessment is fully treated in a note by Mr. Ozanne, late Survey Commissioner, printed as an Appendix to Government Resolution No. 712 of 28th January 1897, on which the following summary is based :—

"Under the existing law there are three different forms, Three different ways of charging in any one of which rates for the use of water. for the use of water, the right to which vests in Government, are chargeable, viz. :

- By the Irrigation Department under the provisions of the Irrigation Act, provided no rate is charged under either section 55 or section 101 of the Land Revenue Code.
- By the Collector under the provisions of section 55, provided no rate is charged under either the Irrigation Act or Section 101.
- By the Survey Department under section 101, Land Revenue Code, provided no rate is charged under either the Irrigation Act or section 55 of the Land Revenue Code.

"The Irrigation Department levies the water rate in the Irrigation Department system of form of a crop rate. Crops are classified according to the amount of water required, and the charge is taken in full only when a full supply is given.

"The rates charged under section 55 are also generally Rates charged under section 55 of in the form of crop rate. Land Revenue Code. These rates have always been treated as temporary and lasting till the imposition of a Bágáit assessment under section 101, or, if the water is supplied from works constructed and maintained by the

Irrigation Department, the imposition of rates under the Mr. H. S. Lawrence. Irrigation Act.

"The assessment fixed under section 101 forms an integral part of the ordinary assessment.

Fixing the pátasthal area and its land revenue and is included in the guarantee given at the time of settlement. It is fixed on an average and is leviable irrespectively of the actual water-supply available in any one year and irrespectively also of the actual use made by the rayat who is at liberty to irrigate any part of his field whether less or more than the area assessed as pátasthal garden, for this is not a definite demarcated area, but an average area according to the judgment of the survey officer."

The latter survey assessment is a consolidated soil and water rate assessed according to the quality of the soil and the ordinary permanence of the water-supply.

Irrigation Commission Memorandum, paragraphs 3, 4 and 5. 14. No exact information on record.

15. *District or village works* are represented by tanks.

Paragraph 6 (1) and (2). They were constructed for the most part originally by former rulers; the statistics (*vide* Table V) show an increase of 27 per cent. in their number from 8,748 to

11,115 between 1886-87 and 1896-97, but this is probably due to imperfect classification of tanks in Kánara, which irrigate half an acre apiece, having been reported to have increased by 1,500 or 50 per cent. In Belgaum also there was an increase from 445 to 859, and in Ahmednagar a decrease from 135 to 6. The causes of these variations are not on record in this office, but enquiry is being made.

In the Karnátak a considerable number were constructed and are controlled by private owners. The more important tanks are controlled by the Public Works Department which repairs them.

The average acreage irrigated was 10·2 acres; this average is the result of figures so divergent as in Broach, Khándesh and Káwara one-half an acre, and in Panch Maháls and Bijápur 105 and 107 acres per tank.

16. The responsibilities of Government in regard to their maintenance were discussed by Committees which were appointed in 1892. The orders of Government upon their recommendations issued in Government Resolution No. 34 W. I.—419 of 5th March 1895, Public Works Department. It was decided to revise the list of tanks from which irrigation revenue was derived, to abandon such as would require an excessive expenditure to place in efficient order (and where necessary to reduce the assessment accordingly), and to entrust the repairs of the remainder to the Public Works Department.

Irrigation Commission Memorandum, paragraph 6 (4). Average annual expenditure, if any, incurred by Government on district or village works, excluding expenditure on relief works during late famines.

17. The subjoined statement shows the number of tanks repaired in the Northern and Southern Divisions under these orders since 1895 :—

District.	1895-96.		1896-97.		1897-98.		1898-99.		1899-1900.		1900-1902.	
	Number of tanks.	Cost.	Number of tanks.	Cost.	Number of tanks.	Cost.	Number of tanks.	Cost.	Number of tanks.	Cost.	Number of tanks.	Cost.
		Rs.		Rs.		Rs.		Rs.		Rs.		Rs.
Ahmedabad .	2	2,330	10	6,221	9	928	*	3,256	40	6,79,113	27	13,64,583
Panch Maháls .	...	...	...	...	1	197	*	2,688	...	330	...	54,849
Broach .	4	673	3	2,300	2	478	4	2,506	...	...	1	199
Surat .	26	20,183	22	19,820	4	2,350	10	7,426	3	5,574	6	8,137
Belgaum .	1	1,192	1	12,331	11	7,412	9	11,349	3	9,929	7	11,258
Bijapur .	4	319	2	114	1	41	*	16	3	1,227	1	258
Dhárwár .	42	43,810	31	52,051	33	21,004	5	33,029	6	44,008	38	58,169
Kánara .	...	...	...	...	...	...	...	...	3	633	*	2,599

NOTE.—In 1899-1900, 38 tanks in Ahmedabad were repaired by famine labour at a cost of Rs. 6,62,705, and in 1900-1901, 26 tanks were newly repaired and repairs to others were continued by famine labour at a cost of Rs. 13,34,574. In the Panch Maháls, items of Rs. 330 and Rs. 54,849 were spent in the famine.

In Kaira some tanks have been repaired by famine labour, but information for these has not been received from the Collector. Similar information for the Southern Division is not reported.

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In the Central Division no repairs were effected under these orders except during the famine, when Rs. 16,328 were expended on two tanks in the Sholapur district.

18. When "the works fail," that is, if the tanks fail into complete disrepair, they are abandoned under the above orders. Proposals to abandon 873 tanks in the Surat district, 609 in Broach, and 402 in Ahmedabad have been submitted to Government, and to abandon 8 in the Panch Mahals district have been sanctioned. Two tanks have also been abandoned in Dhárwar. The question of remitting tank assessment thereon will be considered by the local Revenue authorities when these proposals have been decided.

When in any particular year the tanks fail to supply irrigation, no special provision exists outside the ordinary rules for remission of land revenue for the automatic remission of water assessment.

Irrigation Commission Memorandum, paragraph 6 (5).
Is any irrigation realized or are remissions of land revenue given when the works fail?

19. No information.

It is understood that they are not undertaken by District Boards; it is possible that in Karnatak private landholders undertake them.

Such expenditure would require to be on a commercial basis and commercial enterprise is foreign to the character of District Boards in this Presidency; it is not desirable that District Boards should be invested with the power of levying irrigational rates, or should spend their scanty revenues speculatively.

No such loans have been given to District Boards. To landowners, as shown in Tables VI and VII, Rs. 1,77,226 have been advanced in ten years for this purpose.

Irrigation Commission Memorandum, paragraph 10.
Can the protective value of these works be increased, etc.?

The answer would appear to be—Yes.

20. Local responsibilities cannot be enforced under the existing law. In paragraph 7 of Government Resolution No. 34-W. I.—419 of 5th March 1895, Government accepted the view that it was desirable to render it compulsory on the villagers to furnish such aid as may be required from them in case of emergency, or as may be needed, for the execution of minor annual repairs for the efficient preservation of a tank, and that the law should be altered to this end. Pending such amendment, village officers and Circle Inspectors are ordered to secure the execution of repairs as far as possible by the villagers.

Table VIII gives the sources of water-supply for villages. Irrigational tanks are by comparison not numerous, and being generally situated at a distance from the village site are not of great importance for this purpose.

Irrigation Commission Memorandum, paragraph 7 (1).
Total area irrigated by wells in ordinary years and in years of drought.
Estimate of areas irrigable and actually irrigated by wells and from small village tanks in ordinary years.
Government Memorandum No. P-1053.

22. Information of annual construction is not available; between 1886-87 and 1896-97, the number of wells used for irrigation increased from 166,454 to 207,057, or 24 per cent. (vide Table V). Enquiry is being made as to the number now in existence, and the information will be furnished to the Commission at the end of the month.

Irrigation Commission Memorandum, paragraph 7 (3).
Extent to which construction has been assisted by advances from Government.

Details are given in Tables VI and VII.

During the ten years ending 1899-1900 advances for construction and repair amounted to Rs. 57,61,746. The repair of an old well may roughly be estimated to cost Rs. 50, and the construction of a new well Rs. 200. If we assume that one-fourth was spent on the repair of old and the remainder on the construction of new wells, the number of wells newly constructed will amount to 21,610 and those repaired to 24,808, or, roughly, 50,000 in all.

23. Freedom from enhancement of assessment. It is perhaps doubtful whether cultivators have complete confidence in regard to this concession, though the fact that they have taken loans of Rs. 57 lakhs for the purpose would appear to show that they were free from any serious apprehensions. The distribution in villages of vernacular notices on the subject, a measure which is understood to have been adopted with success in the Central Provinces, would perhaps stimulate construction.

These points are not perhaps within the reference to this Department, but it may be said that the condition of advances appear to be sufficiently liberal. The possibility of diminishing delays in the grant of loans may, however, be considered; as also the expediency of conducting experimental borings on behalf of cultivators by the agency of the Public Works Department.

24. Paragraph 88 of this Department Report for 1899-1900 may be quoted.

In parts of the Deccan and the Karnatak and in Southern Gujarát, the water in the wells got so low that irrigation was intermittent, but the deeper wells of Northern Gujarát did not fail, and numerous *kachcha* wells were sunk at small cost. The cultivators were largely helped by takávi advances in constructing new and deepening old wells. The extended use of wells is visible in all the Gujarát districts, as well as in the North Deccan and Sátára and Bijápúr and Dhárwar.

No information on record.

25. Average depth in Deccan 25—30 feet; in Gujarát 40—50 feet, and sometimes as much as 100 feet. In Karnatak 30 to 60 feet.

Average cost may very roughly be put at Rs. 200, but depends entirely on the character of the well and the depth of water. The report from Mr. Campbell, Executive Engineer on special duty, No. 7, dated 9th February 1885, and other accompaniments to Government Resolution No. 448-C. W.—1059 of 23rd June 1885 may be consulted.

Area served by each. Vide Table V.

Irrigation Commission Memorandum, paragraph 8 (1).
Districts or tracts in which lands or crops are injured by water-logging or excess of water in very wet years.

26. Complaints have chiefly been heard from tracts in Broach, Ahmedabad and Kaira.

Irrigation Commission Memorandum, paragraph 8 (2) and (3).
Are additional drainage works required either on sanitary or agricultural grounds? Source from which funds should be provided for such works.

No information on record.

Before the expiry of the current settlement, no increase of revenue could be realised, but if the measures proved successful, losses of revenue now sustained through remissions, would be saved.

Irrigation Commission Memorandum, paragraph 9. Works executed by relief labour.

Irrigation Commission Memorandum, paragraph 10. Programme of relief works.

Irrigation Commission Memorandum, paragraph 11. Irrigation works in Káthiáwár.

Irrigation Commission Memorandum, paragraph 12. Statistics for typical works.

Irrigation Commission Memorandum, paragraph 13. Irrigation receipts and charges.

Irrigation Commission Memorandum, paragraph 14. Value of works in reducing claims for famine relief.

27. No information on the record of this Department.

28. Tables VI and VII give the information in detail. Takávi Advances. Previous to 1891 takávi Government Memorandum No. P.-1058. was in small demand, but in the last decade, under the stress of disastrous seasons, the system has expanded enormously. In the different tracts there are considerable

differences in the purposes for which the loans are demanded. *Mr. H. S. Lawrence.*

Of the total amount of 104·3 lákhs of rupees advanced, 62 per cent. was devoted to irrigation, and 37 per cent. to other land improvements, and 1 per cent. unspecified.

In Gujarát before 1899-1900 the sums advanced did not exceed Rs. 43,000 in any year, owing, it is believed, to the excellent credit possessed by the Pátidar class and the easy terms on which they received accommodation from the money-lender. In 1899-1900, however, Rs. 6 lákhs were taken in Gujarát entirely for the construction of wells.

In the Deccan in the famine of 1896-97 Rs. 17½ lákhs were given for this purpose, and in the ten years the total amounts to Rs. 39½ lákhs.

In the Karnátak the expenditure on wells and other works of irrigation was inconsiderable in comparison with the expenditure on the construction of embankments and other methods of Field improvements, such as the uprooting of weeds.

29. The subjoined subsidiary statements summarise these variations:—

A.

Division.	IRRIGATIONAL PURPOSES.				Other purposes.	Unspecified.	Total advances.	Percentage.
	Wells.	Tanks.	Others.	Total.				
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
Gujarát	6,89,460	5,550	10,690	7,05,700	1,71,390	17,060	8,94,150	8·6
Deccan	39,47,050	67,480	68,930	40,83,460	5,20,990	75,900	46,80,350	44·8
Karnátak	11,13,310	1,01,810	4,59,170	16,74,290	28,14,500	...	44,88,790	43·0
Konkan	11,930	2,380	11,590	25,900	3,16,570	27,910	3,70,380	3·6
Total	57,61,750	1,77,230	5,50,380	64,89,360	38,23,450	1,20,870	1,04,33,670	100

B.

Division.	IRRIGATIONAL PURPOSES.				Other purposes.	Unspecified.
	Wells.	Tanks.	Others.	Total.		
Gujarát	77·1	0·6	1·2	78·9	19·2	1·9
Deccan	84·3	1·5	1·5	87·3	11·1	1·6
Karnátak	24·8	2·3	10·2	37·3	62·7	0·0
Konkan	3·2	0·6	3·1	6·9	85·2	7·9
Total	55·3	1·7	5·3	62·3	36·7	1·0

30. The statistics of the yield of crops prepared in 1897 are entered in Table IX. The method in which they were prepared is explained in the following extracts from the Memorandum by Mr. Muir-Mackenzie, then Survey Commissioner, which accompanied the report:—

“The general result has been that in the Deccan the estimated yields are considerably below the formulæ figures of 1882. The yields now returned were in the first instance worked out by the Deputy Director of Agriculture, Mr. Mollison, on the basis of the formulæ, crop experiments and personal observation. They were then checked by myself and further revised in discussion with Mr. Mollison. Lastly, Mr. Hoarn, the Superintendent, Konkan Survey, was consulted regarding our final estimates. Mr. Hoarn has probably taken more experiments and knows more of the yields of the ordinary crops in the Konkan and parts

of the Deccan than anyone in the Presidency. He fully discussed the yields with Mr. Mollison and agreed with those at which he and I had arrived. Mr. Hoarn, who was one of the framers of the original formulæ, admitted that the low yields of the poor soils and precarious climates were not enough allowed for in some districts when the formulæ were prepared.

The yield of irrigated crops has been more closely ascertained and stated. Experiments and results on the Poona Farm have brought accurate knowledge of the yield of sugarcane. There can be no doubt that the tendency hitherto has been to greatly under-estimate the production of cereals under well irrigation.”

The crop experiments which have been conducted since 1897 have, owing to the abnormal seasons and the absorption of officers on famine duties, not been sufficiently numerous to justify any alteration of these figures.

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TABLE I.

Areas irrigated by Wells, Tanks, Other Sources and Canals.

YEAR.	Wells.	Tanks.	Other Sources.	Total.	Government Canals.	GRAND TOTAL.	Wells.	Tanks.	Other Sources.	Total.	Government Canals.	GRAND TOTAL.
AHMEDABAD.							KAIBA.					
1892-93 . . .	48,548	16,183	...	64,731	4,020	68,751	24,200	8,067	...	32,267	2,098	34,365
1893-94 . . .	44,353	6,824	3,412	54,589	3,855	58,444	7,419	22,256	...	29,675	190	29,865
1894-95 . . .	41,543	5,642	2,052	49,237	4,241	53,478	6,883	20,649	...	27,532	439	27,971
1895-96 . . .	39,680	6,866	2,224	48,770	5,550	54,320	33,792	...	...	33,792	535	34,327
1896-97 . . .	43,497	10,873	2,930	57,300	5,456	62,756	44,095	2,971	3,248	50,314	842	51,156
1897-98 . . .	43,650	7,281	12,076	63,007	6,142	69,149	34,421	719	1,745	36,885	1,126	38,011
1898-99 . . .	49,302	9,719	4,841	63,862	6,027	69,889	34,126	505	2,244	36,875	2,709	39,584
1899-1900 . .	92,445	88	4,007	96,540	62	96,602	66,378	65	5,083	71,526	...	71,526
PANCH MAHÁLS.							BROACH.					
1892-93 . . .	2,221	164	38	2,423	...	2,423	746	...	...	746	...	746
1893-94 . . .	2,228	187	25	2,390	...	2,390	681	...	...	681	...	681
1894-95 . . .	2,200	200	...	2,400	...	2,400	645	...	...	645	...	645
1895-96 . . .	843	1,043	163	2,049	30	2,079	510	287	...	797	...	797
1896-97 . . .	2,100	210	32	2,342	42	2,384	762	48	...	810	...	810
1897-98 . . .	2,097	170	29	2,296	175	2,471	762	117	...	879	...	879
1898-99 . . .	2,626	143	14	2,683	...	2,683	882	244	14	1,140	...	1,140
1899-1900 . .	7,066	4	317	7,387	...	7,387	5,066	...	2	5,068	...	5,068
SURAT.							KHANDESH.					
1892-93 . . .	7,680	3,204	55	10,979	...	10,979	26,760	13	673	27,446	12,702	40,148
1893-94 . . .	7,789	3,271	45	11,109	...	11,109	31,821	...	729	32,550	12,683	45,233
1894-95 . . .	7,840	2,787	...	10,627	...	10,627	30,879	4	1,041	31,924	12,510	44,434
1895-96 . . .	7,598	2,991	...	10,589	...	10,589	32,376	7	586	32,969	11,963	44,932
1896-97 . . .	7,205	2,835	258	10,298	...	10,298	47,406	6	1,939	49,350	17,011	66,361
1897-98 . . .	6,919	3,238	96	10,253	3	10,256	52,070	207	1,805	54,082	13,610	67,692
1898-99 . . .	6,755	3,521	475	10,751	...	10,751	40,728	46	1,275	42,049	14,162	56,211
1899-1900 . .	12,261	536	127	12,924	...	12,924	51,764	4	4,981	56,749	13,727	70,476
NÁSIK.							AHMEDNAGAR.					
1892-93 . . .	37,403	...	19,224	56,627	25,352	81,979	69,548	...	13,496	83,044	2,084	85,128
1893-94 . . .	42,435	...	10,492	52,927	31,465	84,392	90,968	...	4,373	95,341	3,624	98,965
1894-95 . . .	41,340	3	19,753	61,096	28,554	89,650	68,675	...	12,718	81,393	3,154	84,547
1895-96 . . .	30,017	53	28,817	58,887	21,579	80,466	65,762	...	16,957	82,719	2,783	85,502
1896-97 . . .	59,056	137	19,857	79,050	29,335	108,385	126,581	...	10,649	137,230	6,876	144,106
1897-98 . . .	49,232	154	19,611	68,997	23,312	92,309	96,809	...	6,921	103,730	6,516	110,246
1898-99 . . .	50,298	127	24,673	75,098	18,623	93,721	100,039	...	4,884	105,823	5,731	111,554
1899-1900 . .	54,563	23	7,694	62,280	11,806	74,086	101,290	...	880	102,170	4,512	106,682
POONA.							SHOLÁPUR.					
1892-93 . . .	58,061	...	14,983	73,044	29,486	102,530	73,576	...	6,468	80,044	6,771	86,815
1893-94 . . .	61,977	...	11,934	73,911	34,217	108,128	83,456	...	2,985	86,441	9,158	95,599
1894-95 . . .	63,767	...	9,110	72,877	35,662	108,539	87,282	...	2,730	90,012	8,115	98,127
1895-96 . . .	66,674	...	7,472	73,146	31,774	104,920	82,387	...	2,809	85,196	6,791	91,987
1896-97 . . .	81,612	1,400	11,117	94,129	46,583	140,712	99,388	15	2,311	101,709	13,198	114,847
1897-98 . . .	75,694	1,954	10,808	88,456	54,492	142,948	94,321	...	2,211	96,532	9,145	105,677
1898-99 . . .	66,039	1,858	13,216	81,113	41,225	122,338	94,858	...	2,384	97,242	9,835	107,077
1899-1900 . .	51,904	1,014	2,990	55,908	31,260	87,168	91,918	...	2,061	94,042	19,392	113,434
SÁTARA.							BELGAUM.					
1892-93 . . .	63,085	...	35,721	98,806	6,201	105,007	24,373	12,607	3,362	40,342	3,525	43,867
1893-94 . . .	54,906	...	51,435	106,391	12,765	119,156	26,667	13,559	3,197	43,423	3,578	47,001
1894-95 . . .	64,014	...	45,500	109,514	7,864	117,378	24,449	13,216	4,625	42,290	3,440	45,730
1895-96 . . .	52,272	...	54,180	106,452	7,359	113,811	24,785	13,010	3,598	41,393	3,397	44,790
1896-97 . . .	68,921	...	72,161	141,082	10,947	152,029	27,757	8,560	7,884	44,201	3,550	47,751
1897-98 . . .	59,138	...	56,205	115,343	9,395	124,738	29,470	8,093	8,027	45,590	5,479	51,069
1898-99 . . .	60,554	...	51,713	112,272	8,830	121,102	29,695	9,079	6,899	45,673	4,507	50,180
1899-1900 . .	66,904	...	22,771	89,675	10,562	100,237	29,326	4,238	5,217	38,781	6,174	44,955

*Areas irrigated by Wells, Tanks, Other Sources and Canals—continued.**Mr. H. S.
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Year.	Wells.	Tanks.	Other Sources.	Total.	Government Canals.	GRAND TOTAL.	Wells.	Tanks.	Other Sources.	Total.	Government Canals.	GRAND TOTAL.
BIJAPUR.							DHARWAR.					
1892-93 . .	11,203	1,723	862	13,788	57	13,845	3,644	75,320	3,170	82,134	6,155	89,289
1893-94 . .	9,802	...	1,743	11,545	572	12,117	3,960	68,691	8,154	80,805	4,521	85,326
1894-95 . .	6,838	...	2,734	9,572	1,016	10,588	3,036	61,097	9,197	73,330	4,956	78,286
1895-96 . .	5,493	...	3,052	8,545	853	9,398	3,530	74,061	3,435	81,026	5,628	86,654
1896-97 . .	21,924	1,077	1,103	24,104	152	24,256	3,462	81,843	1,851	87,156	5,008	92,164
1897-98 . .	14,199	506	1,265	15,970	2	15,972	2,992	83,431	3,519	89,942	4,381	94,323
1898-99 . .	12,636	437	1,539	14,612	6	14,618	2,773	82,339	4,252	89,864	4,893	94,757
1899-1900 .	15,239	451	1,874	17,564	14	17,578	3,340	19,791	2,497	25,628	2,320	27,948
THANA.							KOLABA.					
1892-93 . .	4,790	...	...	4,790	...	4,790	2,322	77	77	2,476	...	2,476
1893-94 . .	7,221	...	...	7,221	...	7,221	2,135	71	71	2,277	...	2,277
1894-95 . .	5,905	...	...	5,905	...	5,905	1,922	20	223	2,165	...	2,165
1895-96 . .	5,084	...	...	5,084	...	5,084	2,001	17	241	2,259	...	2,259
1896-97 . .	5,144	...	...	5,144	...	5,144	1,918	15	281	2,215	...	2,215
1897-98 . .	5,493	...	...	5,493	...	5,493	2,061	25	332	2,418	...	2,418
1898-99 . .	2,874	65	2,829	5,768	...	5,768	1,734	27	509	2,270	...	2,270
1899-1900 .	2,429	65	2,556	5,049	...	5,049	1,802	1	283	1,586	...	1,586
RATNAGIRI.							KANARA.					
1892-93 . .	2,247	1,221	2,416	5,884	...	5,884	1,488	5,954	16,650	24,092	...	24,092
1893-94 . .	959	1,296	3,950	6,205	...	6,205	3,077	4,615	17,180	24,852	...	24,852
1894-95 . .	1,545	520	4,058	6,123	...	6,123	2,909	4,363	16,292	23,564	...	23,564
1895-96 . .	3,637	575	3,512	7,724	9	7,733	2,815	4,222	15,533	22,570	...	22,570
1896-97 . .	3,387	401	3,894	7,682	...	7,682	2,275	3,038	15,353	20,666	...	20,666
1897-98 . .	2,999	...	5,724	8,723	...	8,723	2,038	2,643	16,399	21,080	...	21,080
1898-99 . .	2,723	982	5,331	9,035	...	9,035	1,810	3,466	16,365	21,641	...	21,641
1899-1900 .	2,920	768	5,101	8,789	...	8,789	1,611	3,395	14,722	19,728	...	19,728

TABLE II.

Area irrigated by Canals, Wells, Tanks, and Other Sources during 1892-93 to 1899-1900.

		1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.
GUJARAT	Government Canals . .	6,118	4,045	4,680	6,015	6,340	7,446	8,736	62
	Wells	83,345	62,470	59,111	82,423	97,659	87,849	93,591	183,216
	Tanks	27,703	32,488	29,278	11,187	16,937	11,525	14,132	693
	Other Sources . .	93	3,486	2,052	2,387	6,468	13,946	7,388	9,536
	Total	111,146	98,444	90,441	95,997	121,064	113,320	115,111	193,445
	Total, irrigated area .	117,264	102,489	95,121	102,022	127,404	120,766	123,847	193,507
DECCAN	Government Canals . .	82,596	103,912	95,859	82,249	123,890	116,470	98,406	91,259
	Wells	528,433	365,563	355,957	328,433	482,959	427,264	413,416	418,406
	Tanks	13	...	7	60	1,558	2,315	2,031	1,041
	Other Sources . .	90,565	81,998	90,552	110,821	118,033	97,561	98,150	41,377
	Total	419,011	447,561	446,816	439,369	602,550	527,140	513,597	460,824
	Total, irrigated area .	501,607	551,473	542,675	521,618	726,440	643,610	612,008	552,083

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Area irrigated by Canals, Wells, Tanks and Other Sources during 1892-93 to 1899-1900—continued.

		1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.
KARNATAK.	Government Canals	9,737	8,671	9,412	9,878	8,710	9,862	9,406	8,509
	Wells	39,220	40,429	34,323	38,808	53,143	46,661	45,104	47,904
	Tanks	89,650	82,250	74,313	87,071	91,480	92,030	92,355	24,480
	Other Sources	7,394	13,094	16,556	10,085	10,838	12,811	12,690	9,588
	Total	136,264	135,773	125,192	130,964	155,461	151,502	150,149	81,972
KONKAN.	Total, irrigated area	146,001	144,444	134,604	140,842	164,171	161,364	159,555	90,481
	Government Canals	...	...	...	9	...	...	...	...
	Wells	10,847	13,392	12,281	13,537	12,724	12,591	9,140	8,263
	Tanks	7,252	5,982	4,903	4,814	3,454	2,668	4,549	4,229
	Other Sources	19,143	21,181	20,573	19,286	19,529	22,455	25,034	22,661
TOTAL, PRESIDENCY PROVINCE.	Total	37,242	40,555	37,757	37,637	35,707	37,714	38,714	35,152
	Total, irrigated area	37,242	40,555	37,757	37,646	35,707	37,714	38,714	35,152
	Government Canals	98,451	116,628	109,951	98,151	138,940	133,778	116,548	99,829
	Wells	461,845	481,854	461,672	458,256	646,485	574,865	561,251	657,789
	Tanks	124,623	120,720	108,501	103,182	113,429	108,588	113,058	30,443
	Other Sources	117,195	119,759	130,033	142,579	154,868	146,773	143,262	83,162
	Total	708,663	722,333	700,206	703,967	914,782	829,676	817,571	771,394
	Total, irrigated area	802,114	838,961	810,157	802,118	1,053,722	963,454	934,119	871,223

TABLE III.

Gross and culturable area together with proportions of culturable area protected by Government irrigation works, private or village works, and wells.

District.	Gross Area.	Culturable Area.	PROPORTIONS OF CULTURABLE AREA PROTECTED BY			
			Government irrigation works.	Private or village works.	Wells.	Total.
GUJARAT.						
Ahmedabad	2,171,762	1,704,631	0.2	0.7	2.9	3.8
Kaira	988,764	821,721	0.1	1.0	3.8	4.9
Panch Mahals.	1,027,686	726,114	0.0	0.0	0.4	0.4
Broach	920,594	675,882	0.0	0.0	0.2	0.2
Surat	1,082,185	802,112	0.0	0.3	1.0	1.3
Total	6,090,941	4,730,460	0.1	0.5	2.0	2.6
DECCAN.						
Khandesh	4,773,452	3,535,114	0.4	0.0	1.1	1.5
Nasik	3,634,575	2,501,515	1.0	0.7	1.8	3.5
Ahmednagar	4,120,212	3,164,381	0.2	0.2	2.8	3.2
Poona	3,364,683	2,502,754	1.5	0.4	2.6	4.5
Sholapur	2,906,383	2,479,224	0.4	0.1	3.6	4.1
Satara	2,874,332	2,153,164	0.4	2.2	2.8	5.4
Total	21,673,639	16,336,152	0.6	0.5	2.4	3.5
KARNATAK.						
Belgaum	2,812,527	2,195,086	0.2	0.7	1.2	2.1
Bijapur	3,616,756	3,227,077	0.0	0.1	0.4	0.5
Dharwar	2,868,957	2,412,321	0.2	3.0	0.1	3.3
Total	9,298,240	7,834,484	0.1	1.2	0.5	1.8
KONKAN.						
Thana	2,214,911	1,050,600	0.0	0.1	0.5	0.6
Kolaba	1,316,517	751,701	0.0	0.0	0.3	0.3
Ratnagiri	444,402	287,927	0.0	1.1	0.9	2.0
Kanara	2,524,897	388,244	0.0	5.2	0.6	5.8
Total	6,500,727	2,478,472	0.0	1.0	0.5	1.5
GRAND TOTAL	43,563,547	31,379,568	0.4	0.7	1.7	2.8

TABLE IV.

*Rainfall at Head-quarter Station.*Mr. H. S.
Lawrence.

District.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	Average for 10 years.
	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
GUJARAT.											
1. Ahmedabad . . .	25.59	51.18	43.75	51.61	31.85	32.40	31.18	36.53	4.72	16.78	32.56
2. Kaira	28.27	58.45	41.17	49.55	33.71	40.28	24.07	34.63	6.05	21.98	33.82
3. Panch Mahāla (Godhra). . . .	29.08	44.72	49.02	59.92	36.43	47.37	36.01	42.49	8.67	32.73	38.74
4. Broach	58.64	39.12	52.24	65.49	28.84	69.99	42.34	47.51	9.61	32.80	44.66
5. Surat	63.89	55.15	45.45	65.08	29.07	42.83	39.02	32.52	18.49	34.19	42.57
DECCAN.											
6. Khāndesh (Dhulia). .	24.58	27.87	24.77	23.08	29.05	26.52	30.84	21.03	8.54	13.88	23.02
7. Nāsik	25.99	35.14	39.38	30.08	29.51	36.24	28.46	27.59	14.57	32.98	30.00
8. Ahmednagar . . .	16.18	42.16	25.55	25.35	25.97	19.66	18.23	14.78	12.32	17.85	21.80
9. Poona	18.68	45.19	32.12	33.59	32.48	43.41	37.18	22.92	12.37	30.56	30.85
10. Sholāpur	23.76	39.28	33.35	20.97	31.60	18.40	20.42	34.85	12.81	18.93	25.44
11. Satāra	36.30	43.47	43.96	50.28	37.12	50.83	46.61	35.97	20.34	43.47	40.83
KARNATAK.											
12. Belgaum	43.34	64.01	49.67	48.19	47.09	63.70	45.28	52.79	28.63	63.50	50.62
13. Bijāpur	13.70	35.37	28.95	25.11	30.38	11.03	28.47	26.08	19.07	13.74	23.19
14. Dhāwār	27.84	37.26	32.34	25.81	29.88	39.64	41.24	41.95	23.26	31.21	33.04
KONKAN.											
15. Thāna	99.35	131.62	93.95	107.86	92.62	133.70	121.17	108.30	41.87	89.61	102.00
16. Kolāba (Alibāg) .	82.05	117.42	80.38	93.30	81.17	113.75	101.02	101.48	44.45	80.01	89.50
17. Ratnāgiri	91.17	137.60	87.99	96.89	85.40	67.78	136.16	118.97	59.21	95.92	97.71
18. Kānara (Kārwār) .	82.28	154.56	111.98	90.66	102.99	99.32	129.75	133.75	72.33	131.17	110.88

TABLE V.

Wells and tanks and estimates of areas irrigable and actually irrigated from wells and tanks.

District.	WELLS.			TANKS.			WELLS.			TANKS.			
	1886-87.	1891-92.	1896-97.	1886-87.	1891-92.	1896-97.	Number in 1896-97.	Area irrigable (at an estimate of 4 acres per well).	Area irrigated.	Area irrigated per well.	Number in 1886-97.	Area irrigated.	Area irrigated per tank.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
GUJRAT.													
	No.	No.	No.	No.	No.	No.	No.	Acres.	Acres.	Acres.	No.	Acres.	Acres.
Ahmedabad . . .	13,548	14,526	13,209	887	1,123	1,082	13,209	52,836	43,497	3.3	1,082	10,873	10.05
Kaira	8,057	8,708	8,984	724	913	891	8,984	35,936	44,095	4.9	891	2,971	3.3
Panch Mahāla . .	1,212	1,365	1,545	2	2	2	1,545	6,180	2,100	1.3	2	210	105.0
Broach	654	703	723	78	81	105	723	2,892	762	1.05	105	48	0.46
Surat	6,186	5,873	6,038	1,024	961	964	6,038	24,152	7,205	1.2	964	2,835	2.9
Total	29,687	31,175	30,499	2,715	3,080	3,044	30,499	121,996	97,659	3.2	3,044	16,937	5.5
DECCAN.													
Khāndesh	15,854	17,097	22,015	11	25	15	22,015	88,060	47,406	2.1	15	6	0.4
Nāsik	13,031	14,218	18,009	75	10	9	18,009	72,036	59,056	3.2	9	137	15.2
Ahmednagar . . .	22,035	22,278	27,649	139	135	6	27,649	110,595	126,581	4.6	6	...	...
Poona	16,177	17,780	20,176	80	52	21	20,176	80,704	81,612	4.04	21	1,400	63.6
Sholāpur	15,022	16,432	19,095	5	4	11	19,095	76,380	99,383	5.2	11	15	1.3
Satāra	19,222	19,206	22,326	18	20	24	22,326	89,304	68,921	3.1	24	...	...
Total	101,341	107,011	129,270	328	246	86	129,270	517,080	482,959	3.7	86	1,558	18.1
KARNATAK.													
Belgaum	7,690	8,560	10,059	229	445	859	10,059	40,236	27,757	2.7	859	8,560	9.9
Bijapur	3,787	4,901	7,185	4	10	10	7,185	28,740	21,924	3.05	10	1,077	107.7
Dhārwār	4,004	4,413	4,511	2,310	2,687	2,404	4,511	18,044	3,462	0.77	2,404	81,843	34.0
Total	15,481	17,874	21,755	2,543	3,142	3,273	21,755	87,020	53,143	2.4	3,273	91,480	27.9
KONKHAN.													
Thāna	3,887	4,045	4,096	15	10	13	4,096	16,384	5,144	1.2	13	...	...
Kolāba	1,446	1,303	1,334	1	1	3	1,334	5,336	1,918	1.4	3	15	5.0
Ratnāgiri	3,054	4,485	5,758	36	74	65	5,758	23,032	3,387	0.58	65	401	6.2
Kānara	11,558	12,188	14,345	3,110	4,321	4,631	14,345	57,380	2,275	0.15	4,631	3,038	0.65
Total	19,945	22,021	25,533	3,162	4,406	4,712	25,533	102,132	13,724	0.5	4,712	3,454	0.73
GRAND TOTAL . .	166,454	178,081	207,057	8,748	10,874	11,115	207,057	828,228	646,485	3.1	11,115	113,429	10.2

Mr. H. S.
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TABLE VI.

Takavi advances given for the construction and repairs of Wells, Tanks and Other Sources of irrigation and for other improvements.

YEAR.	Total advances under Land Improvement Act.	FOR IRRIGATION PURPOSES.				For other improvements of land.	Total advances under Land Improvement Act.	FOR IRRIGATION PURPOSES.				For other improvements of land.
		Wells.	Tanks.	Others.	Total.			Wells.	Tanks.	Others.	Total.	
AHMEDABAD.							KAIRA.					
1890-91 . . .	7,775	7,775	...	...	7,775	...	...	...	...	...	...	...
1891-92 . . .	3,900	3,400	...	...	3,400	500	4,725	3,650	225	...	3,875	850
1892-93 . . .	2,600	850	...	...	850	1,750	2,090	2,090	...	...	2,090	...
1893-94 . . .	275	275	...	...	275	...	940	300	...	160	460	480
1894-95 . . .	4,725	4,575	...	...	4,575	150	3,005	2,930	...	...	2,930	75
1895-96 . . .	12,735	9,205	...	...	9,205	3,530	1,520	400	...	...	400*	1,120
1896-97 . . .	3,705	3,005	...	700	3,705	...	7,560	7,560	...	...	7,560	...
1897-98 . . .	2,110	2,110	...	...	2,110	...	2,450	2,450	...	...	2,450	...
1898-99 . . .	1,735	1,635	...	100	1,735	...	100	100	...	...	100	...
1899-1900	144,201	141,301	...	...	141,301	2,900	214,749	205,839	...	8,910	214,749	...
PANCH MAHALS.							BROACH.					
1890-91 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1891-92 . . .	200	200	...	...	200	...	...	...	...	...	...	...
1892-93 . . .	...	...	...	...	...	...	550	500	50	...	550	...
1893-94 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1894-95 . . .	300	300	...	...	300	...	...	...	...	...	...	...
1895-96 . . .	350	350	...	...	350	...	2,235	2,235	...	...	2,235	...
1896-97 . . .	550	550	...	...	550	...	555	...	...	520	520	35
1897-98 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1898-99 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1899-1900	17,057	Details	not available.		...	...	151,277	151,277	...	...	151,277	...
SURAT.							KHANDESH.					
1890-91 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1891-92 . . .	18,840	3,000	500	...	3,500	15,340	2,000	Details	not available.		...	...
1892-93 . . .	14,900	1,400	...	300	1,700	13,200	1,700	1,700	...	...	1,700	...
1893-94 . . .	16,465	5,250	500	...	5,750	10,715	4,500	3,600	...	200	3,800	700
1894-95 . . .	5,825	4,350	1,475	...	5,825	...	11,800	3,350	...	8,450	11,800	...
1895-96 . . .	25,585	3,875	...	...	3,875	21,710	23,000	19,800	...	...	19,800	3,200
1896-97 . . .	15,165	4,250	300	...	4,550	10,615	142,195	139,095	...	305	139,400	2,795
1897-98 . . .	390	300	...	...	300	90	7,745	7,745	...	...	7,745	...
1898-99 . . .	11,759	7,175	...	...	7,175	4,584	16,450	16,175	...	...	16,175	275
1899-1900	191,247	105,000	2,500	...	107,500	83,747	256,705	255,715	...	...	255,715	990
NASIK.							AHMEDNAGAR.					
1890-91 . . .	8,265	500	...	...	500	7,765	3,375	3,375	...	...	3,375	...
1891-92 . . .	17,673	9,500	...	...	9,500	8,173	20,250	18,950	...	1,300	20,250	...
1892-93 . . .	24,650	19,700	...	...	19,700	4,950	13,025	12,200	...	...	12,200	825
1893-94 . . .	18,730	14,425	...	4,005	18,430	300	8,010	7,460	...	...	7,460	550
1894-95 . . .	29,900	...	Details not available.		...	...	19,010	16,585	...	2,425	19,010	...
1895-96 . . .	36,452	27,725	...	...	27,725	8,727	25,410	21,205	...	...	21,205	4,205
1896-97 . . .	139,755	132,745	...	4,010	136,755	3,000	656,176	638,681	...	17,495	656,176	...
1897-98 . . .	6,160	6,160	...	...	6,160	...	100,270	91,530	...	...	91,530	8,740
1898-99 . . .	4,365	4,325	...	...	4,325	40	21,332	21,332	...	...	21,332	...
1899-1900	193,333	197,268	...	...	197,268	1,065	350,337	342,167	...	...	342,167	8,170
POONA.							SHOLAPUR.					
1890-91 . . .	...	...	...	...	...	...	2,300	1,800	...	500	2,300	...
1891-92 . . .	92,035	78,970	...	13,065	92,035	...	42,565	30,135	...	12,430	42,565	...
1892-93 . . .	40,350	22,195	18,155	...	40,350	...	57,450	25,480	...	750	26,230	31,220
1893-94 . . .	18,785	12,665	800	...	13,465	5,320	10,535	5,510	...	...	5,510	5,025
1894-95 . . .	31,225	23,640	...	...	23,640	7,585	23,660	14,015	...	...	14,015	9,645
1895-96 . . .	34,635	25,325	...	...	25,325	9,310	24,875	13,125	...	...	13,215	11,660
1896-97 . . .	372,903	272,820	48,530	3,000	324,350	48,553	367,050	332,240	...	...	332,240	34,810
1897-98 . . .	39,030	30,955	...	250	31,205	7,825	12,660	4,460	...	...	4,460	8,200
1898-99 . . .	48,480	34,570	...	...	34,570	13,910	37,575	22,730	...	...	22,730	14,845
1899-1900	290,720	236,812	...	...	236,812	53,908	103,550	99,305	...	...	99,305	4,245

Takavi advances given for the construction and repairs of Wells, Tanks and Other Sources of irrigation and for other Improvements—contd.

Mr. H. S. Lawrence.

Year.	Total advances under Land Improvement Act.	For Irrigation Purposes.				For other improvements of land.	Total advances under Land Improvement Act.	For Irrigation Purposes.				For other improvements of land.
		Wells.	Tanks.	Others.	Total.			Wells.	Tanks.	Others.	Total.	
SATARA.							BELGAUM.					
1890-91 . . .	3,640	...	...	...	...	3,640	69,965	11,225	800	11,440	23,465	46,500
1891-92 . . .	43,988	...	Details not available.				187,705	57,135	...	127,195	184,830	3,375
1892-93 . . .	18,540	14,385	...	...	14,385	4,155	42,860	8,140	3,100	...	11,240	31,620
1893-94 . . .	18,975	15,985	...	...	15,985	2,990	104,850	29,495	2,700	200	32,395	72,455
1894-95 . . .	22,365	14,060	...	...	14,060	8,315	152,550	49,450	3,550	50	53,050	99,500
1895-96 . . .	37,570	22,655	...	...	22,655	14,915	166,525	43,325	1,500	3,000	47,825	118,700
1896-97 . . .	351,393	239,795	...	550	240,345	111,048	403,750	70,320	53,780	...	124,100	279,650
1897-98 . . .	17,955	15,615	...	...	15,615	2,340	...	...	...	...	...	...
1898-99 . . .	45,205	37,345	...	200	37,545	7,660	54,500	16,000	1,500	125	17,625	36,875
1899-1900 . .	302,768	267,363	...	...	267,363	35,405	257,020	101,211	3,075	1,575	105,861	151,159
BIJAPUR.							DHARWAR.					
1890-91 . . .	2,200	1,200	...	...	1,200	1,000	61,280	23,700	...	1,000	24,700	36,580
1891-92 . . .	224,791	76,787	200	47,497	124,484	1,00,307	233,560	30,475	2,700	250,385	283,560	...
1892-93 . . .	14,802	8,222	1,700	...	4,922	9,880	24,741	7,381	1,100	...	8,481	16,260
1893-94 . . .	51,485	3,290	...	...	3,290	48,195	164,275	22,325	2,450	...	24,775	139,500
1894-95 . . .	125,950	15,630	...	...	15,630	1,10,320	191,675	19,475	2,025	...	21,500	170,175
1895-96 . . .	97,020	7,775	...	...	7,775	89,245	167,175	36,040	2,760	1,130	39,930	127,245
1896-97 . . .	918,625	351,670	...	1,220	352,890	5,65,735	266,830	33,700	4,200	300	38,200	228,630
1897-98 . . .	19,330	4,675	...	...	4,675	14,655	400	...	...	...	...	400
1898-99 . . .	32,567	6,920	...	...	6,920	25,647	40,292	9,975	1,300	7,500	18,775	21,517
1899-1900 . .	146,115	41,750	...	...	41,750	1,04,365	215,955	31,023	13,366	6,554	50,943	165,012
THANA.							KOLABA.					
1890-91 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1891-92 . . .	...	...	...	...	...	...	...	...	...	...	...	...
1892-93 . . .	380	...	...	...	...	380	1,900	...	...	...	...	1,900
1893-94 . . .	5,740	200	...	...	200	5,540	3,815	...	...	...	...	3,815
1894-95 . . .	3,600	300	...	...	300	3,300	9,805	800	...	...	300	9,505
1895-96 . . .	5,250	...	...	...	...	5,250	16,410	...	...	...	...	16,410
1896-97 . . .	5,075	...	...	...	...	5,075	51,870	1,600	...	...	1,600	50,270
1897-98 . . .	...	...	...	...	...	...	8,000	450	...	...	450	7,550
1898-99 . . .	3,150	600	...	...	600	2,550	6,950	...	...	...	...	6,950
1899-1900 . .	54,055	1,345	...	...	1,345	52,710	25,930	500	...	...	500	25,430
RATNAGIRI.							KANARA.					
1890-91 . . .	...	...	...	...	...	...	4,200	...	...	...	...	4,200
1891-92 . . .	...	...	...	...	...	...	18,950	Details not available.	...	...	...	...
1892-93 . . .	...	...	...	...	...	...	23,000	...	500	1,300	1,800	21,200
1893-94 . . .	450	...	...	...	...	450	22,950	...	...	3,400	3,400	19,550
1894-95 . . .	8,960	Details not available.				...	19,210	720	1,035	6,840	8,595	10,615
1895-96 . . .	7,955	...	...	...	...	7,955	18,123	1,900	830	50	2,780	10,343
1896-97 . . .	16,015	2,950	...	...	2,950	13,065	...	...	...	...	...	...
1897-98 . . .	5,730	...	...	...	...	5,730	...	...	...	...	...	...
1898-99 . . .	3,570	...	...	...	...	3,570	7,183	550	20	...	570	6,613
1899-1900 . .	8,000	...	...	...	...	8,000	9,200	510	...	...	510	8,690

Mr. H. S.
Lawrence.

TABLE VII.

Tadavi advances granted for the construction and repairs of Wells, Tanks and Other Sources of irrigation and for other Land Improvements.

	1891-92.	1892-93.	1893-94.	1894-95.	1895-96.	1896-97.	1897-98.	1898-99.	1899-1900.	Total.	Average.
GUJARAT.											
Total advances	7,775	27,665	20,140	17,680	42,425	27,535	4,950	13,394	*718,631	*894,150	*89,415
Wells	7,775	10,250	4,840	5,825	16,065	15,365	4,860	8,910	603,417	689,462	68,946
Tanks . . . . .	...	725	50	50	...	300	...	...	2,500	6,550	555
Other Sources of irrigation . . . . .	...	300	300	160	...	1,220	...	100	8,910	10,890	1,089
Total	7,775	10,975	5,190	6,485	16,065	16,885	4,860	9,010	614,827	703,702	70,570
Other improvements of land . . . . .	...	16,690	14,950	11,195	26,390	10,650	90	4,581	86,847	171,391	17,139
Total advances	17,580	*218,611	155,715	79,535	181,942	2,029,469	183,320	173,407	1,502,413	*4,680,352	*468,085
Wells	5,675	137,552	95,860	59,645	129,935	1,755,376	166,465	136,477	1,398,630	3,947,045	394,705
Tanks . . . . .	...	18,155	18,155	800	...	48,530	...	...	...	67,436	6,743
Other Sources of irrigation	500	26,795	750	4,205	...	25,360	...	200	...	64,935	6,493
Total	6,175	164,347	114,565	64,650	129,935	1,829,266	166,715	136,677	1,398,630	4,083,465	408,346
Other improvements of land	11,405	8,173	41,150	14,885	52,017	20,208	27,165	36,730	103,783	520,996	52,099
Total advances	133,445	696,056	82,403	320,610	431,720	1,589,205	19,730	127,359	619,090	4,488,793	448,579
Wells	36,125	164,397	18,743	55,110	84,555	455,690	4,675	32,895	173,984	1,113,314	111,331
Tanks	800	2,900	5,900	5,150	4,260	57,980	...	2,800	16,441	101,806	10,181
Other Sources of irrigation	12,440	425,077	...	200	4,130	1,520	...	7,635	8,229	459,171	45,917
Total	49,365	592,974	24,643	60,460	95,535	515,190	4,675	43,320	198,554	1,674,291	167,429
Other improvements of land	84,080	103,682	57,760	260,150	335,190	1,074,015	15,055	84,039	420,536	2,814,502	281,450
Total advances	4,200	*18,950	25,230	32,955	42,738	72,960	18,730	20,853	97,185	*370,376	*37,037
Wells . . . . .	...	...	...	209	1,900	4,550	450	1,150	2,355	11,925	1,193
Tanks . . . . .	...	500	500	...	830	...	...	20	...	2,385	238
Other Sources of irrigation . . . . .	...	1,300	1,300	3,400	50	...	...	...	...	11,590	1,159
Total . . . . .	...	1,800	1,800	3,600	2,780	4,550	450	1,170	2,355	25,940	2,590
Other improvements of land	4,200	23,430	29,355	23,420	39,958	68,410	13,280	19,683	94,830	316,566	31,657
Total advances	163,000	*961,182	283,488	450,780	697,235	3,719,169	222,230	335,213	*2,987,219	*10,433,671	*1,043,367
Wells	49,575	312,199	119,243	120,780	233,030	2,230,981	166,450	179,432	2,178,386	5,761,746	576,175
Tanks	800	3,625	24,505	6,450	5,000	106,810	...	2,800	18,941	177,226	17,723
Other Sources of irrigation	12,940	451,872	2,350	7,965	4,180	28,100	250	7,925	17,039	550,386	55,038
Total	63,315	767,696	146,198	135,195	244,300	2,365,891	166,700	190,177	42,214,866	6,489,358	648,936
Other improvements of land	99,685	128,545	137,290	315,585	453,525	1,353,278	55,530	145,086	705,796	3,823,455	382,345

* The totals marked with asterisk do not agree with the actual total of the details as they include sums for which no details are supplied.

TABLE VIII.

*Wells and Tanks used for drinking purposes and for cattle and washing—1896-97.**Mr. H. S.
Lawrence.*

District.	WELLS.		TANKS.		District.	WELLS.		TANKS.	
	For drinking supply of human beings, but not for irrigation.	For cattle and washing and other purposes, but not for irrigation or drinking supply of human beings.	For drinking supply of human beings solely.	For cattle and washing and other purposes, but not for irrigation or drinking supply of human beings.		For drinking supply of human beings, but not for irrigation.	For cattle and washing and other purposes, but not for irrigation or drinking supply of human beings.	For drinking supply of human beings solely.	For cattle and washing and other purposes, but not for irrigation or drinking supply of human beings.
GUJARÁT.					KARNÁTAK.				
Ahmedabad .	2,078	618	503	2,150	Belgaum .	5,923	784	158	693
Kaira .	2,038	536	24	3,720	Bijápur .	2,411	842	87	238
Panch Mahals .	1,624	120	19	690	Dhárwár .	4,222	3,778	1,123	2,841
Broach .	1,776	1,190	63	1,983					
Surat .	6,469	1,318	162	678					
Total .	14,040	3,782	771	9,221	Total .	12,556	5,404	1,368	3,760
DACCAN.					KONKAN.				
Khándesh .	23,664	891	23	98	Thána .	7,139	377	34	938
Násik .	6,718	584	18	130	Kolápa .	4,972	316	104	598
Ahmednagar .	5,242	1,025	14	56	Ratnágiri .	6,232	793	136	179
Poona .	4,452	399	56	143	Kánara .	20,461	1,404	699	1,771
Sholápur .	3,303	532	5	187					
Satára .	5,044	253	50	90	Total .	38,804	2,890	973	3,484
Total .	48,423	3,684	165	704	GRAND TOTAL .	113,823	15,760	3,277	17,169

TABLE IX.

Estimated Acre Yield of the principal Crops.

Serial Number.	District.	IRRIGATED.								DRY-CROP.					
		Rice.	Wheat.	Spelt.	Jowári.	Ragi.	Gram.	Ground-nut.	Sugar-cane.	Rice.	Wheat.	Spelt.	Jowári.	Ragi.	Gram.
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1	Ahmedabad .	...	1,300	...	...	...	...	...	6,000	1,440	560	...	1,080	1,440	500
2	Kaira .	...	1,300	...	...	...	...	...	6,000	1,320	600	...	1,050	1,440	500
3	Panch Mahals .	...	1,300	...	...	...	...	...	5,000	1,200	700	...	1,190	1,420	600
4	Broach .	...	...	...	...	...	...	...	7,000	900	600	...	(maize) Kh. 1,160 R. 1,020	1,500	500
5	Surat .	...	...	...	...	...	...	3,000	7,000	1,560	560	...	1,160	1,200	500
6	Khándesh .	...	1,280	1,500	...	...	1,200	3,000	7,000	1,080	600	...	720	900	500
7	Násik .	...	1,320	1,500	Kh. ... R. 1,400	1,400	1,200	3,000	7,000	1,080	460	...	520	850	350
8	Ahmednagar .	...	1,360	1,600	Kh. ... R. 1,800	1,400	1,200	3,000	7,000	1,040	480	...	Kh. ... R. 540	900	330
9	Poona .	...	1,080	1,500	Kh. ... R. 1,500	...	1,200	3,000	7,000	1,120	350	...	500	900	320
10	Sholápur .	...	1,080	1,500	Kh. ... R. 1,500	...	1,200	3,000	7,000	900	400	...	Kh. ... R. 540	...	360
11	Satára .	...	1,350	1,500	Kh. ... R. 1,500	...	1,200	3,000	7,000	1,120	480	...	720	900	330
12	Belgaum .	...	1,200	1,500	Kh. ... R. ...	...	...	8,000	7,000	1,140	560	...	800	900	400
13	Bijápur .	...	1,080	1,500	...	...	...	3,000	7,000	800	400	...	540	...	340
14	Dhárwár .	...	...	1,500	...	...	...	3,000	7,000	1,140	600	...	800	1,200	500
15	Thána .	...	...	...	...	...	...	...	7,000	1,200	...	...	...	Early 770 Late 1,540	400
16	Kolápa .	...	...	...	...	...	...	...	4,000	1,320	...	...	...	Early 800 Late 1,600	380
17	Ratnágiri .	...	...	...	...	...	...	...	4,000	1,020	...	...	...	Early 680 Late 1,360	320
18	Kánara .	...	...	...	...	...	...	...	7,000	1,320	...	...	...	1,470	480
19	Karachi .	960	929	...	585	...	325	...	4,350	...	...	...	...	...	...
20	Hyderabad .	1,140	1,083	...	1,008	...	440	...	2,560	...	...	...	...	...	...
21	Shikárpur .	1,200	1,246	...	1,167	...	846	...	...	...	...	...	...	...	...
22	Upper Sind Frontier .	...	903	...	652	...	302	...	...	...	...	...	...	...	...
23	Thar and Pákar .	900	560	...	...	...	...	...	...	...	...	...	...	...	...

NOTE.—As rice generally gets only a few waterings at the close of the season, no figures for irrigated rice have been separately shown.

Mr. A. R.
Bonus.

(3) Mr. A. R. Bonus, I.C.S., Collector of Násik.

I.

Information on some of the points mentioned in the memorandum of questions by the Irrigation Commission, embodied in Government Resolution No. 2275, dated 26th October 1901.

2. The gross area in the district is 3,743,671 acres.
The culturable area in the district is 2,511,017 acres.

The proportion of the culturable area which is protected by Government irrigation work is .	0.65
The proportion of the culturable area which is protected by private works	0.35
The proportion of the culturable area which is protected by village works . . . . .	...
The proportion of the culturable area which is protected by wells	1.55

A statement comparing these acres for the last five years is attached (I).

The soil of the open country ranges from deep black loam to light-coloured gravel; in the hilly country (P laterite) soil is found in places. The general geological formation is Deccan trap.

Nearly all kinds of kharif and rabi crops grow in the plains, especially wheat, bájrí, jowári, gram and sugarcane, etc.; rice also grows where it gets abundant canal water.

The soil of the rainy hill country produces rice, náglí varáí, tur and udid. Wheat, bájrí and gram are also grown on this soil, but only to a small extent.

Extent to which cultivation is dependent on artificial irrigation.—Statement No. II will show the extent to which the different crops are dependent on irrigation.

RAINFALL.

The average rainfall of the Násik district at head-quarters during the rainy season is about 30 inches and at taluka head-quarters it is as under :—

	Inches.	Cents.
Sinnar	26	28
Igatpuri	143	83
Dindori	31	39
Niphád	25	31
Chándor	27	84
Yeola	24	58
Málegaon	22	27
Nándgaon	23	74
Báglan	21	40
Kalwan	27	69
Peint	94	32

The average is for eleven years (1887–1897) as found by the Survey Commissioner and published at page 88 of the *Bombay Government Gazette*, Part III, for 1900.

How the distribution of water is controlled.—In the case of bandhárás in charge of the Revenue Department, i.e., the revenue of which is credited to Land Revenue, the distribution is controlled by the village and taluka authorities. They see that the irrigators take water on fixed days and at fixed hours and irrigate only authorized parts of the fields.

In the case of bandhárás in the charge of the Public Works Department, i.e., the revenue of which is credited to that Department, the distribution is controlled by the officers of the Public Works Department and also by village officers concerned, to whom information about the grant of water is supplied, and they control the distribution accordingly. Petitions are received by the officers of the Public Works Department for water for a particular area, and they dispose of them according to the supply of water in a particular year.

In what form the irrigation revenue is collected.—The phrase "Irrigation Revenue" is applied only to the bandhára revenue creditable to the Public Works Department. This revenue is realized in the form of water-cess which is fixed by the Public Works Department according to the nature of crops for which water is allowed. The collection is managed by the Revenue Department. Village officers collect the revenue and remit to the Taluká Treasuries on receipt of statements annually from the public Works Department.

In the case of Revenue bandhárás the assessment is collected by the village officers with other items of Land Revenue.

6. *By whom district or village irrigation works are constructed and controlled.*—District irrigation works are constructed and controlled by the Public Works Department and village works by the Civil Department.

Number of district or village irrigation works and the aggregate extent of cultivation dependent on them.—The following is the number of district and village works :—

	Rs.
Násik	50
Sinnar	46
Dindori	27
Niphád	27
Chándor	43
Yeola	2
Kalwan	29
Báglan	44
Málegaon	12
Nándgaon	2
Total	232

Besides these there are the Parsul, Ozar, Tambat, Pal-khad, and Wasali Canals.

In all there are 286 canals of varying size.

Responsibilities of Government in connection with the maintenance of district or village works as fixed at former settlement.—In the interest of the irrigation revenue Government must keep the works in constant repair, as if the source of irrigation fails the revenue must be remitted.

In the case of the older works the repairs of the channels and water-courses are carried out by Government agency, but 10 per cent. of the cost is recovered from the irrigators. There is no distinct authority for this procedure. Repairs to the main heads, tanks, etc., are, however, carried on entirely at Government expenses. It is to be observed that not a few of the minor dams (bandhárás) are at present silted up and useless.

Have new district or village irrigation works been constructed of late years otherwise than as famine relief works ?—No new district or village irrigation works such as would be useful to cultivation have been constructed of late years. The Khirdi Sáthe, Odol and Chankápur tanks have been begun but not completed.

Neither private land-owners nor the District Local Boards have undertaken or can undertake such works : nor can Government afford money for loans to them for such purposes.

The works constructed in the late famines as well as those existing before them have considerable value as sources of water-supply for men and cattle without reference to irrigation.

The following sums were expended on village tanks in the late famines of 1899–1900 and 1900–1901 :—

	Rs.
1. Hiswal Tank	1,267
2. Sherul Tank	1,758
3. Dewalghát Tank	723
4. Khadke Tank	2,322
5. Dapure Tank	1,929
6. Sayane Tank	4,968
7. Zodge Tank	8,065
8. Palasdare Tank	380
9. Chikhalwahal Tank	1,838
10. Kalandari Tank	185
11. Pokhri Tank	929
12.	193
13. Mánikpurnj Tank	192
13. Rangári Tank	1,849
	21,288
14. Khokad Tank	14,798
15. Maparwádi Tank	6,578
16. Sonaj Tank	6,815
	49,279

Of the above-mentioned only two were completed before the monsoon of 1901, viz., the Maparwdai and Sonaj tanks.

As the rainfall of 1901 was inadequate, it is not yet possible to say how far the works will be useful.

The protective value of the Deccan irrigation works during the famine of 1897 was considerable, but in 1899, 1900 and 1901 it became less and less in each year as the rains were less heavy and the subterranean springs gradually failed.

No accurate statistics, such as can be relied on as data for a scientific inquiry, are available as to the areas irrigated in the year 1897 and subsequently, but in Statement No. 1 rough statistics are given.

Famine relief was necessary to some extent in the form of employment on relief works and also in the form of gratuitous relief in most of the villages protected by irrigation works. In the case of agricultural labourer and non-agriculturists residing in such villages, as in the years of drought they could not get usual field-labour to the fullest extent owing to the high prices of grain and the diminution of area cultivated, agriculturists failed to employ the usual number of labourers and did much of the work themselves. Such labourers and their dependents had therefore to be relieved at the works or by dole. It is beyond doubt, however, that the cost of famine relief would have been more if the irrigation works had not been in operation, as in that case a greater number of agriculturists themselves would have resorted to relief works.

Mr. A. R.
Bonus.

Statement No. I showing culturable and irrigated area, Násik Division.

Serial No.	Year.	Gross area.	Culturable area.	PERCENTAGES OF AREAS PROTECTED.				
				By canals.		By wells.	By tanks.	By other sources.
				Government.	Private.			
1	2	3	4	5	6	7	8	9
1	1896-97 . .	3,724,162	2,450,580	1.2	...	2.4 (59,056 acres.)	.0058	.81
2	1897-98 . .	3,724,297	2,450,234	.95	.0086	2.009 (49,232 acres.)	.0064	.79
3	1898-99 . .	3,722,994	2,450,788	.75	...	2.05 (50,298 acres.)	.0052 .0052	.006 1.006
4	1899-1900 . .	3,741,947	2,501,515	.47	.0060	2.18 (54,563 acres.)	...	.30
5	1900-1901 . .	3,742,671	2,511,017	.65	.035	1.55 (39,170 acres.)	...	.45

Explanation.

Column 3 represents the total area of the district.

Column 4 includes net area cropped (after deducting the area cropped more than once), current fallows and assessed and unassessed area available for cultivation.

Column 5 represents area commanded by Government canals directly managed by the Irrigation Department and the revenue derived from which is credited to that Department.

Column 7.—The figures in *italics* in column 7 show the area in acres under well-irrigation, while the roman figures represent the percentages of this area with reference to the total culturable area. This information is given only with respect to well-irrigation which has been taken to mean "artificial irrigation."

Column 9 represents area under páta and bandhárás managed by the Revenue Department and the revenue derived from which is credited to that Department.

Statement No. II showing the names of crops irrigated and the number of waterings they require.

Names of crops irrigated.	Period during which crops are watered.	Number of waterings and the intervals at which they are given.	REMARKS.
Sugarcane . .	Throughout the year as this is a perennial crop.	45 waterings, each after an interval of 8 days.	When the rains prove amply sufficient the period of watering can with safety be prolonged to a fortnight. So long as the rains continue no water is required, but whenever there is a break lasting over a period of 15 days, the crop stands in need of one watering every fortnight. In some parts ground-nut is required to be irrigated after an interval of 8 to 15 days.
Ground-nut . .	<i>Wet weather crop</i> — June to October. <i>Hot weather crop</i> — October to February.	8 waterings, each after an interval of 15 to 20 days. When the rains prove sufficient ground-nut stands in need of little or no irrigation.	
Potatoes . .	<i>Wet weather crop</i> — June to August. <i>Hot weather crop</i> — October to February	8 waterings, each after an interval of 20 days.	
Chillies . .			
Onions . .			
Garlic . .			

Mr. A. R.
Borus.

Names of crops irrigated.	Period during which crops are watered.	Number of waterings and the intervals at which they are given.	REMARKS.
Rice . . .	July to October . . .	No water required during days of actual rainfall. In September and October the crop is required to be irrigated every fourth or sixth day.	
Wheat . . . Gram . . . Udid . . . Khonda . . . Walkhad . . .	October to January . . . March to May . . .	4-6 waterings, each after an interval of 20 to 30 days. 8 waterings, each after an interval of 15 days.	

Answers to printed questions.

II.

1. The answers below refer to the Násik district.

As I only came to this district in April 1901 and have never seen it before, I cannot say that I am well acquainted with it as yet.

2. A statement showing the average rainfall in each month of the year at the head-quarters of the district and also at the head-quarters of each of the talukas in the district is attached.

3. Practically there is no obstacle to the extension of irrigation arising from—

- (1) Sparsity of population.
- (2) Insufficient supply of cattle suited to the cultivation of irrigated land. In the famine of 1899-1900 a large number of cattle died in the district, but this mortality did not tell upon irrigators as in irrigated lands the cultivators had reaped the usual khondya and kodval crops for their cattle and saved them.
- (3) Insufficient supply of manure. I do not think this would prove an obstacle.
- (4) Unsuitability of soil (e.g., black cotton soil) to irrigation. In this district cotton soil exists in several talukas and irrigated crops are grown in it. Generally speaking, the soil of the plain is suited to irrigation.
- (5) Uncertainty of water-supply. There is something in this. Canals and reservoirs not fed direct from the rainy regions of the Ghats are always liable to give out early, and well-sinking is always somewhat of a speculation in the Deccan. Even where water is found, it not unfrequently runs short in seasons of drought.
- (6) Capital would have to be borrowed for the most part. Whether it would be procurable would largely depend on the extent to which Government could give tágai and on the effect produced by the recent amendments to the Land Revenue Code. These latter will for a time cause a lock-up of loanable capital.
- (7) Fear of enhanced rent or revenue assessment does not deter or discourage irrigators from extending irrigation, as they are willing to pay a proportionate share of the produce they realize from improvements.
- (8) Uncertainty of tenure or defects of the Tenancy Law.

The tenancy in this district is the Mirási tenure, under which the cultivators have no fear of their land changing hands except through their own fault in not paying the assessment or incurring debt. Causes 5 and 6, viz., the uncertainty of the supply of water, etc., or lack of capital, expenditure, etc., have, however, often acted as obstacles to the extension of irrigation.

4. In section 107 of the Land Revenue Code provision has been made to safeguard the improvements made by cultivators to their own lands at their own expenses.

5. Loans under the Land Improvement Loans Act are taken freely for the extension of irrigation by the people who can furnish security, i.e., generally by those whose lands are not mortgaged, etc. I do not recommend any of the measures (1) to (6).

6. The extension of irrigation does not tend to injure the remaining cultivation by attracting its cultivators to the irrigated tracts. Still I have no doubt that the people of this district would welcome the extension of means of irrigation to their unirrigated land.

7 and 8. The irrigation increases the value of the produce of land—

- (1) by rendering it possible to cultivate two harvests instead of one;
- (2) by leading to the substitution of more far less valuable crops or varieties;
- (3) by increasing the yield—
 - (a) in a year of ample rainfall;
 - (b) in a year of scanty rainfall;
 - (c) in a year of drought.

It is difficult to say to what extent exactly irrigation increases the value of the produce of the land, but from local inquiry it appears that in the first case it increases from 50 to 100 per cent.; in the second from 25 to 75 per cent.; in the third (a) from 25 to 50 per cent.; in the third (b) from 40 to 75 per cent.; and in the third (c) from 50 to 100.

I can give no trustworthy estimate on this point.

9. The annual rate per acre paid on account of irrigation by the owner of land to Government varies from Rs. 6 to Rs. 20. This rate is paid in the form of a water-rate and is recovered either along with the rent of land or separately as irrigation revenue.

The annual rate per acre paid on account of irrigation by the cultivator to the owner of the land varies from Rs. 10 to 25. In these cases the rate is not payable on the area actually irrigated during the year. The cultivators and owners of land fix a sum of annual rent by mutual agreement on one or more survey numbers containing irrigated and unirrigated land, and the agreed amount of annual rent is paid by cultivators to the owners of land.

In reference to the canals in charge of the Revenue Department, the rate fixed by the Survey Department is paid annually. This rate is not changed during the period of settlement.

With reference to the canals in charge of the Public Works Department, the rate for water is paid according to the rates fixed for each kind of crop sown in a particular area and not for whole numbers, etc.

10. The extent to which private expenditure is necessary to bring water to the field or to prepare any land for irrigation is dependent on the quality and situation of the land.

This expenditure is generally incurred by the landlord in the first instance, but when it is incurred in special cases by tenants the period of tenancy is comparatively longer without a proportionate increase in the rental, which secures him against losses.

11. No appreciable damage resulted to the people or deterioration to the soil from irrigation without manure, from too profuse or too extensive irrigation in this district.

12, 20 and 21. (1) Canals or groups of canals of intermittent flow in the Násik district are supplied with water from nallas, across which temporary dams are thrown up by the rayats at their own expense and the channels are also kept clean by them.

(2) The irrigator is allowed to take water upon the condition that he does so without stopping or injuring the current and only when his turn comes. Turns are fixed by the village panch. No instances have come to notice in which the rights are mismanaged in any one village, though there have been cases in which two or more different villages have disputes about the proportions of water to be taken by each, and the Civil Courts are a sufficient remedy against these.

(3) (a) In years of ample rainfall water is maintained generally from November to February.

[illegible]

Mr. A. R.
Borus.

III.

Supplementary Note on point No. 7 of the Memorandum of points to be considered by the Indian Irrigation Commission.

Total area irrigated—

	Acres.
(a) in ordinary years	61,472
(b) in years of drought	91,200

The former figure is an average for five years from 1891-92 to 1894-95, and the latter is also an average of two years, viz., 1896-97 and 1899-1900. In the former year 108,385 acres of land were irrigated and in the latter 74,086 acres only. The water-supply was abundant in 1896-97, while in 1899-1900 it was scanty. Number of new wells constructed annually during the last ten years are—

1892	244
1893	189
1894	190
1895	290
1896	718
1897	1,655
1898	558
1899	987
1900	955
1901	1,069
	<u>6,855</u>

Construction of wells was assisted by Government to the following extent:—

	Rs.
Advanced for constructing wells in 1899-1900	1,84,231
Advanced for constructing wells in 1900-1901	1,26,452

No concession other than that laid down in section 107 of the Land Revenue Code is given to the constructor of new wells. Till the expiry of the settlement for the time being in force no water-rate or *bágait* assessment is levied on land irrigated from new wells in a survey number. Though it is desirable to stimulate the construction of new wells by more liberal advances or inducements, it is not practicable under existing circumstances to do so to any great extent. Under the present rules for granting *tagál* which require substantial security, comparatively few grants can be made. There are no trustworthy data to show the extent to which wells were affected by successive droughts for 1899 to 1901.

Last year Mr. Moore, while on tour in Málegaon, collected statistics of wells that had run dry. In six villages out of 329 wells, 246 had become dry by the middle of December 1900.

Most of the wells which had run dry were deepened, and the results were partially successful, a temporary increase of supply being obtained in about three cases out of every four.

The average distance of water below surface level varies from 10 to 30 feet and, the cost of wells used for irrigation varies from Rs. 400 to Rs. 1,200.

The area served by each irrigation well in normal year varies from 5 to 16, or in rare cases 20 acres.

(4) Mr. R. A. LAMB, I.C.S., Collector, Ahmednagar.

Answers to printed questions.

Mr. R. A.
Lamb.

I was Collector of Poona during 1897-1898 and of Ahmednagar from the end of October 1899 to the end of May 1901. I served as Assistant Collector in Khândesh for about 6½ years.

9. The uncertainty of the supply is a defect which, in my judgment, applies not only to wells and village works as Mr. Brendon points out, but also to all works which are not fed from an area of assured rainfall. As yet there are no works in the Nagar District which are so fed. I submitted some months ago a separate report to Government indicating where I thought such works might be constructed [Question 3 (5)].

3. I am doubtful of the propriety of granting any remission in the case of failure in the attempt to obtain water [Q. 6 (4)] and of making Government grants-in-aid of private wells [Q. 5 (6)].

4. Question 6 (1) No.

(2) No.

(3) Yes.

5. Section B. There are none in Nagar. The immense value of such canals was very manifest in Poona in 1896-97, to anyone passing through the villages, under the Nira Canal.

6. Section C. Under this section fall not only the village works regarding which Mr. Brendon has furnished information, but also the Ojhar and Lakh Canals which are Public Works Department works. The uselessness of these canals in years of scanty rainfall and of drought will be cured when the Makaladeri tank is completed. I concur generally in what Mr. Brendon says regarding village works.

7. Section D Q 23 (1). One Bhatodi tank is supplied with water by the surface flow of several *nalas* all lying within the area of uncertain rainfall.

(2) The water is distributed to the land by canals and ducts.

(3) (a) I do not know.

(b) The supply ceases before the end of the cold weather, earlier or later according as the rainfall is more or less scanty.

(c) In a year of drought there is no supply.

(4) The area irrigated can be obtained from the records.

8. Q. 2.—I have no knowledge of the working of the tank in a year of ample rainfall. In years of scanty rainfall one crop may be raised on a restricted area or there may be no crop. I do not think that canal-watered land is ordinarily watered from wells also. (Q. 26). There are not to my knowledge any tanks constructed by private persons, nor is it necessary to encourage such construction (Qs. 31 and 32.) The tank silts up badly. (Q. 33).

9. Section E. I concur generally in Mr. Brendon's report on wells. I do not consider the extension of well-digging a sound protection against famine, because in years of drought or of continued scanty rainfall the subsoil water falls so low that only a restricted area or none can be irrigated in the famine years, and because the tendency is to allow all but the best wells to fall into disuse during years of good rainfall, so that when famine comes a considerable or great number of constructed wells are no longer available for irrigation. The selection of a spot in which to sink a well is largely a matter of luck (Q. 38). I do not think it is the business of Government to sink wells in lands which are private property, or in occupied lands.

(5) Mr. B. P. MILSOM, M.I.C.E., Executive Engineer, Sholapur District.

Answers to printed questions.

Mr. B. P.
Milsom.

2. The character of the soil of the district, generally speaking, is *mirumy* in the higher-lying portions of the district, with black soil in the valleys.

The average rainfall is about 20 inches.

The crops that require watering are—

(i) Perennial, such as sugarcane, plantains, garden-land, etc., require water all the year round—36 to 48 waterings.

(ii) Eight months' crops, such as superior class rice, ground-nut, chillies, onions, tobacco, and tur,

require water from June to January—about 16 waterings.

(iii) Monsoon dry crops, such as *bājri*, maize, dry-rice, rala, require water from June to October—3 to 6 waterings.

(iv) Rabi crops, such as *jowāri*, wheat and gram, require water from October to January—3 to 10 waterings.

(v) Fodder requires water from January to June—10 to 15 waterings.

Distribution is controlled by Departmental Agency, there being karkuns employed one for every 15 to 20 miles of canals, and under them Patkaria, one for from 5 to 10 miles, according to the extent of irrigation anticipated; the whole being under the supervision of the subordinate in charge of the tank.

The revenue is realized by the Civil Department on figures furnished to them by the Public Works Department.

3. The undersigned has had very little experience of tanks constructed in black-cotton soil. There are a number in the district, but all so small as to be more in the nature of ponds than tanks, holding not more than 3 to 5 feet of water, and chiefly used for watering cattle, etc.

So far as undersigned can offer an opinion, it is that high earthen dams cannot be constructed of black-cotton soil alone, and even with masonry core walls, would not be likely to prove satisfactory.

In black soil there is no demand for water, except in cases of prolonged drought, and in cases where a large area of such soil is under command, the revenue is more precarious than in cases of tanks commanding other classes of soil.

So far as undersigned is aware there has been no desire shown for irrigation works on the part of owners of black soil.

4. Descriptions of existing Government irrigation works and their total annual irrigating capacity have been furnished to the Superintending Engineer on special duty, and will, doubtless, be furnished to the Commission by that officer.

In the cases of all four of the tanks in operation in this district, viz., Mhasvad, Ekruk, Ashti and Koregaon, it cannot be said that they can be depended on in a season of drought, as during last year very little irrigation was possible from any of them (compared with what they should be capable of) on account of short storage of water.

5. Cannot answer.

6. Cannot answer.

7. Cannot answer. The Collector will probably be able to give this information. In the opinion of the undersigned, it is most desirable to stimulate the construction of new wells in every possible way.

8. Cannot answer.

9. Relief labour was employed on—

(i) Improvements to roads and metal-breaking.

(ii) Railways, earth-work and ballast-breaking.

(iii) Large irrigation works.

The amounts expended on each class will be intimated later.

Of the incompleting large irrigation works, the undersigned considers that it is most desirable to complete Pathri and Wadshivna tanks at once: the estimated cost of these is—

Rs.

Pathri	1,22,000
Wadshivna	40,000

The following sums have been already spent on these two tanks:—

Rs.

Pathri	8,28,000
Wadshivna	1,71,000

and so long as they remain incomplete, no benefit is obtained from this large expenditure, and the work already done must deteriorate very considerably.

If completed, it is probable that these works would mitigate the effects of any future famine in their immediate vicinity, and in the case of Pathri, it would also render possible a permanent water-supply to Barsi town, where the present supply is, at times, very far from adequate.

Moreover, the work remaining to be done on these two tanks is, most of it, not suitable for the employment of famine labour, it being, for the most part, the completion of outlets, canals, etc.

The sums mentioned above as having been spent on and being required to complete Pathri and Wadshivna tanks, show the value of the work at normal rates.

12. (i) and (ii). Information on these points from 1891-92 has already been furnished to the Superintending Engineer on special duty, and he will, no doubt, supply it to the Commission. A statement, so far as information is available, for years previous to 1891-92, accompanies for works now in operation.

13. The scale of water-rates is as follows:—

	Mhasvad tank.	Ekruk tank.	Ashti tank.	Koregaon tank.
	R. a. p.	R. a. p.	R. a. p.	R. a. p.
Perennial crops	13 0 0	18 0 0	13 0 0	6 0 0
Eight months' crops	4 0 0	4 0 0	4 0 0	2 0 0
Rabi crops	2 0 0	2 8 0	2 0 0	2 0 0
Monsoon dry crops	0 12 0	1 0 0	0 12 0	2 0 0
Hot weather crops	6 0 0	6 0 0	4 0 0	2 0 0

Applications for water are received annually for perennial crops, and for others, during their seasons. Applications are entertained in order of receipt, so long as water is available.

In years of favourable rainfall the demand for irrigation, and, it also follows, irrigation revenue, falls off very considerably, and the effect on the following year depends entirely on the monsoon intervening.

Tanks are not, by any means, always empty at the end of the irrigating season.

Undersigned finds it difficult to arrive at a conclusion as to whether irrigation works get a fair credit for the increase of revenue due to their construction, for there are so many indirect advantages that dwellers in the vicinity enjoy; but on the whole he is unable to show that they do not.

Charges for maintenance and establishment are quite fair; no one is employed on anything but the tank concerned.

The question as to whether the Revenue Accounts may be accepted as correctly indicating the financial results attained by each work, depends, to some extent, on whether each work is considered to get a fair credit for the increase of revenue due to its construction: if it is thought that this is the case, the Revenue Accounts may be accepted as correctly indicating the financial results attained.

14. Undersigned is of opinion that three, at least, of the irrigation tanks in this district (he has no knowledge of Koregaon) did, to a considerable degree, mitigate the effects of the recent famine in their vicinity. As to the other points embraced in this question, the Collector of the district is in a better position to reply than the undersigned.

In conclusion, undersigned would beg to state that his experience of irrigation works is so very limited, that he ventures to suggest that the Commission will kindly bear that fact in mind when considering his memoranda.

Mr. B. P
Milesom

Name of Tank.	Year.	Total discharge through the sluices.	Total leakage gauged.	Balance at the end of the year.	Amount stored during the year.	Amount run over the waste weir.	Total run-off for the year.	Total rainfall.	Percentage of run-off over rainfall of the year.	Area of Land Irrigated during the Year.			Maximum Discharge Passed through the Several Minor Canals.						
										Kharif.	Rabi.	Total.	Theoretical cubic feet per second.	Actual maximum cubic feet per second.	Left Bank Low Level Canal.	Right Bank High Level Canal.	Left Bank High Level Canal.		
FERRIS TANK.	1871-72	Not available.	The leakage of this tank is not through the dam but through the outlet which is utilized for irrigation.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	445	70.00 per second.	Not available.	Not available.	Not available.			
	1872-73			Do.												
	1873-74			1,278.58													99	237	328
	1874-75			1,924.44													199	299	498
	1875-76			2,111.30													237	191	448
	1876-77	719.02	361	272	633	578	1,170	1,748	Left Bank Low Level Canal : 70.00 per second. Right Bank High Level Canal : 60.00 ditto. Left Bank High Level Canal : 25.00 ditto.	Not available.	Not available.	Not available.							
	1877-78	2,387.10	1,394	444	1,839														
	1878-79	2,451.24	562	379	941														
	1879-80	1,846.83	742	481	1,223														
	1880-81	2,457.93	775	312	1,087														
	1881-82	1,341.83	816	423	1,239	Left Bank Low Level Canal : 70.00 per second. Right Bank High Level Canal : 60.00 ditto. Left Bank High Level Canal : 25.00 ditto.	Not available.	Not available.	Not available.										
	1882-83	2,361.54	746	520	1,306														
	1883-84	2,466.44	825	515	1,440														
	1884-85	2,105.20	...	...	...											
	1885-86	2,461.21	1,750	636	2,596														
1886-87	2,695.66	2,231.14	1,830	636	2,068	33.04	11.05	Left Bank Low Level Canal : 70.00 per second. Right Bank High Level Canal : 60.00 ditto. Left Bank High Level Canal : 25.00 ditto.	Not available.	Not available.	Not available.								
1887-88	2,391.80	4,491.00	9,131.29	0.187	1,357	757	2,114												
1888-89	1,728.90	1,800.29	1,800.29	11,355.01	0.323	1,620	1,358					2,978							
1889-90	2,366.71	3,292.54	3,075.45	811.78	0.279	1,335	1,189					2,534							
1890-91	2,393.46	...	2,208.68	6,314.94	0.148	1,835	763					2,593							
MURVAD TANK.	1871-72	Not available.	The leakage from this tank dam passes to the sea, where it is picked up and utilized for irrigation.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	207	Main Canal No. I : 180.70 Do. No. II : 170.83	Not available.	Not available.	...			
	1872-73			
	1873-74			
	1874-75			
	1875-76			
	1876-77						
	1877-78	...	...	...	...	...	...	...	...		
	1878-79	...	...	...	...	...	...	...	...		
	1879-80	...	...	...	...	...	...	...	...		
	1880-81	...	...	...	...	...	...	...	...		
	1881-82	...	...	...	...	...	...	...	...		
	1882-83	...	...	...	...	...	...	...	...		
	1883-84	...	...	...	...	...	...	...	...		
	1884-85	...	...	...	...	...	...	...	...		
	1885-86	477.13	1,097.76	...	33,207.38	0.155	617	727	1,344	Main Canal No. I : 180.70 Do. No. II : 170.83	Not available.	Not available.	...						
1886-87	1,541.16	Not available.	5,001.48	26,774.00	0.506	1,717	2,144	3,861											
1887-88	2,074.68	1,647.38	13,583.00	22,101.99	0.190	2,966	3,139	6,104											
1888-89	1,929.05	1,684.67	4,203.49	29,752.55	0.500	4,074	2,718	6,792											
1889-90	1,411.55	1,603.27	14,866.69	15,790.32	0.119	4,081	3,025	7,106											
1890-91	1,722.95	1,891.34	1,676.88	15,490.68	0.142	3,544	4,760	8,304	Right Bank Channel.	Not available.						
1871-72	...	...	...	...	...	...	...	...			
1872-73	...	...	...	...	...	...	...	...			
1873-74	...	...	...	...	...	...	...	...			
1874-75	...	...	...	...	...	...	...	...			
KORGAON TANK.	1875-76	Not available.	The leakage from this tank dam passes to the sea, where it is picked up and utilized for irrigation.	Not available.	Not available.	Not available.													

Name of Tank.	YEAR.	Total discharge through the sluices.	Total leakage gauged.	Balance at the end of the year.	Amount stored during the year.	Amount run over the waste weir.	Total run-off for the year.	Total rainfall.	Percentage of run-off over rainfall of the year.	AREA OF LAND IRRIGATED DURING THE YEAR.			MAXIMUM DISCHARGE PASSED THROUGH THE SEVERAL MINOR CANALS.				
										Kharif.	Rabi.	Total.	Theoretical cubic feet per second.	Actual maximum cubic feet per second.			
											Acres.	Acres.	Acres.	Right Bank Channel.			
											Not available.	Not available.	Not available.				
KORSON TANK—continued.	1861-62	Not available.	The leakage from this tank dam passes to the main, where it is picked up and utilized for irrigation.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Right Bank Channel—4.21 per second.	Not available.	...		
	1862-63														...		
	1863-64														...		
	1864-65														...		
	1865-66														...		
	1866-67														...		
	1867-68	45.73					318.00	0.538	28	160	185	...					
	1868-69	37.21			43.68	Not flowed.	171.00	0.169	83	223	276	...					
	1869-70	47.30		62.62	125.16	47.70	48.68	0.465	181	79	280	...					
	1870-71	37.63		44.95	...	...	172.86	0.228	13	323	336	2.97			...		
ASHTI TANK.	1871-72	Not available.		Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Not available.	Left Bank Canal—4.00 per second. Right Bank Canal—16.00	Not available.	Not available.	
	1872-73																...
	1873-74																...
	1874-75																...
	1875-76																...
	1876-77																...
	1877-78																...
	1878-79																...
	1879-80																...
	1880-81																...
1881-82	5,640.45													0.137	77	82	169	3.14	5.60	...
1882-83	67.53	23.02	709.37	774.95	Not available.	137	111	248	4.32	5.94	...						
1883-84	96.89	23.02	267.61	Not available.	1,487.59	0.016	Not available.		739	16.00	6.44	...					
1884-85	Not available.	23.02	74.65	33.91	4,894.67	0.245	Do.		440	3.97	16.00	...					
1885-86	35.07	23.02	533.79	1,200.77	6,244.25	0.165	405	334	739	5.73	3.46	...					
1886-87	127.73	23.02	838.86	1,030.83	4,355.03	0.170	445	23	768	6.51	3.80	...					
1887-88	158.31	23.02	611.88	742.00	3,603.56	0.107	585	373	958	11.80	6.31	...					
1888-89	268.06	23.02	318.60	386.78	Not flowed.	336.78	6,389.62	0.217	980	1,437	2,417	10.80	6.11	...			
1889-90	245.40	23.02	780.20	...	...	1,388.63	4,601.25	0.108	829	618	1,447	10.08	3.00	...			
1890-91	180.71	23.02	749.03	...	...	468.89	3,889.98	0.203	778	548	1,326	10.75	4.23	...			

Statement showing the expenditure incurred on Famine works in the Sholdpur District up to end of September 1901.

	1896-97.	1897-98.	1898-99.	1899-1900.	1900-1901.	1901-1902.	Total.
I—Improvements to roads and metal-breaking.	...	...	...	4,15,307	3,28,929	1,240	7,45,476
II—Railways; earth-work and ballast-breaking.	...	...	...	1,05,285	3,70,095	2,118	4,73,262
III—Large Irrigation works.	14,339	6,03,223	1,63,017	5,70,881	15,74,920	6,80,451	36,08,831
IV—Village tanks . .	...	...	...	...	668	15,306	15,974
V—Miscellaneous . .	...	...	...	...	475	...	475
TOTAL . .	14,339	6,03,223	1,63,017	10,91,473	22,75,087	6,94,879	48,42,018

Mr.
Gokhale.

(6) MR. NILKANTH GOVIND GOKHALE, Retired Assistant Engineer, 1st Grade, Irrigation Department.

I

Answers to printed questions.

A.—GENERAL.

1.—The Deccan districts and Gujarát, Poona, Sátára, Nagar and Násik, Sholápur, Khándesh and Belgaum. I was in charge of some of the principal irrigation works in the districts named above. I surveyed some, constructed and managed others, especially the Krishna canal works from the beginning to the end; Chikhli canals; Mhaswad tank canal No. 2; Mayani tank and canal; Yerale water works; Ner tank; Mutha canals (Poona); Lakh and Ozar canals (Nagar and Násik); Ikruk tank and canal (Sholápur); Jamda canal; Hartala tank and canal (Khándesh); Hatmati canal (Gujarát); and other old petty channels. I have also inspected the Ganges canal and the Káveri canals and compared the existing systems of irrigation in those provinces with that which obtains here.

3.—(1) Yes. On an average the labour of three persons per acre is available under command of the Krishna canal (Sátára district), while the labour of only one man is available for 26 acres on the Lakh and Ozar canals (Nagar and Násik districts).

(2) Yes. There is an insufficient supply of cattle for want of grazing land free of charge or at a moderate rate. When there were no stringent rules of the Forest Department, people had large numbers of cattle, but since then the number is reduced to a minimum.

(3) Yes. Inadequate supply of cattle has naturally curtailed the source of manure. Even bones are exported.

(4) Yes, to a certain extent; but this can be partly remedied by an abundant supply of manure in black cotton soil.

(5) Yes, very great obstacle: for crops fail and people are ruined doubly. They lose their seed and labour and there is no prospect of a crop. By too late commencement there is an untimely supply of water, which only benefits late crops. Too early cessation is also ruinous, but it can be partly remedied by a profuse use of cowdung and ash manure.

(6) Yes, it is. In the first place, the cultivators are too poor to spend. In the second place, if some of them have money, they are afraid of spending it for fear of enhancement of water-rate and also land assessment. Some may have funds to spend on expensive cultivation of irrigated crops, but they are afraid of the uncertainty of timely and sufficient water-supply. Also they fear that the return they expect is not proportionate to the litful enhancement of rates, which they anticipate on account of the uncertainty of land tenure. They, therefore, naturally wish for a permanent settlement.

(7) Yes, quite so. They heartily wish for a permanent settlement.

(8) Yes. Uncertainty of tenure discourages cultivators to spend large sums of money on land improvement.

(9) Poverty, want of credit with the Sawkárs, deep ignorance, no improvement in the set old methods of irrigation, the rough conservatism, want of proper scientific directions by Government or public bodies or experts as regards varieties of manure appropriate to different crops.

4.—No such exemption, as far as I am aware.

5.—As far as I am aware people do not largely take advantage of this loan for improving their lands for the following reasons:—They complain that they do not actually get the exact amount advanced and against the heavy rate of interest. Sometimes it happens that the advance made goes to recover arrears of land revenue. The terms on which the money is advanced are hard. The rate offered on promissory notes may be charged on the advance made. I would like to recommend one or more of the remedies pointed out in the question as individual cases permit.

6.—No case has come to my knowledge. Yes. There is a strong desire to have irrigation extended. It is growing stronger and stronger on account of the unequal distribution of the rain and increase of population.

B.—CANALS OF CONTINUOUS FLOW.

7.—(1) It is true. Two crops can be grown instead of one rich crop, but they are of inferior kind and the labour required is therefore greater. Hence there is no appreciable increase in the value of the produce of the land.

(2) The answer is the same as for (1).

(3) (a). If there is timely and ample rainfall, artificial irrigation does not increase the value of the yield. It is in that case absolutely superfluous.

(3) (b). Yes. It is necessary even for a normal yield, and on account of the failure of crops in unirrigated lands the value of the yield of irrigated lands is necessarily increased.

(3) (c) Much more so in the case of droughts.

8.—(1) The increase is in proportion to the difference between the value of indifferent crop and full crop and varies according to the market rates on the demand and supply principle.

(2) There is almost no irrigation in the Deccan in a year of drought, unless the canals are provided with supplementary reservoirs.

9.—(3) The rate per acre varies according to local circumstances.

11.—Yes, damage results to both people and soil. By irrigation without manure the soil is spoiled, the salts oozing out. By too profuse irrigation it is spoiled by saturation. By too extensive irrigation damage results on account of the inability of the cultivator to bestow on his land adequate labour and manure. By too frequent irrigation the soil deteriorates for want of a sufficient supply of manure. From water-logging the salts in the soil come up and salt efflorescence damages crops and soil. This can be remedied by proper drainage. The extent of the damage depends on the local circumstances. Inadequacy or excess of any one particular thing is sufficient to damage the crops and spoil the land. The Krishna canal irrigation is of over 20 years' standing, and the evil stood for nearly 15 years or more until it was minimised by drainage; and this I say from my own personal experience of the Krishna canal, the Mutha canal and the Gokák canal.

C.—CANALS OF INTERMITTENT FLOW.

15.—Well-irrigation is taken advantage of only during the periodical cessation of water from the canal. This is absolutely necessary to save crops when the cessation extends over a number of days.

21.—As far as I am aware no private persons have constructed big canals, nor are they allowed to do so by Government.

22.—Yes. This could best be done by encouraging private capitalists under certain guarantees as in the case of certain Railway Companies. When the capital so invested is paid off with interest at a fixed rate, the property in the canal must lapse to Government, the difference between the present revenue to Government from unirrigated land and the revenue after irrigation being paid to defray the current expenses and those of construction.

D.—TANKS.

24 to 32.—There is no appreciable difference.

33.—There is some inconvenience in as much as no water can be stored up for cultivation on one hand, but, on the other, alluvial soil is some gain, though with a small reduction in area. The silt is not removed by dredging or otherwise; as, for instance, the Katraj tank (Poona) and many a tank in the Madras Presidency and Mysore. No steps seem to have been taken anywhere to remove the silt. It can be economically removed by famine labour.

E.—WELLS.

34.—In the Deccan generally—

(1) The average depth of wells is from 16 to 40 feet.

(2) The natural supply is from springs and they are fed by percolation.

In ordinary years it does not fail or become so much saline as to be useless for cultivating crops, e.g., chilli crop which yields better crop by saline water.

(3) That depends on the nature of the ground; generally it requires Rs. 500.

(4) Permanent. It, however, varies according to the drought.

(5) By a *mot*—a large leather bag holding about four to six cubic feet of water, or a Persian wheel or scooping.

(6) Two to five acres according to local facilities.

(7) Two to five acres.

37—(2) From annas 8 to Rs. 4½ per acre over the assessment for a jirait now fixed by Survey Settlement according to the capacity of the well. The rates are paid on the area attached to and commanded by the well.

38.—(1) Yes. There are professional men called Pānabude, who pretend to know the under-currents of water. No boring is taken, and many people have therefore to lose labour and money spent on a well.

39.—(2) Difficulty of finding money. None that I am aware of. Gratuitous help is never given. Free use of tools and implements with free labour is the only inducement to make it successful, and when successful a certain percentage of the total cost may be borne by the cultivator.

II.

Supplementary Memorandum of Evidence to be given before the Irrigation Commission.

Large works like the Mutha canals have done great good, but much water is lost by percolation from the canals; and it can be picked up with great advantage. I have suggested such pickup-weirs, large and small, when opportunities occurred for so doing while in service. I suggested, for instance, a pickup-weir for using the waste water from the Gokák Mills in my report at the close of my service. The water-supply to the Gokák Mills runs waste, and it is so great that a canal may be maintained out of it. A

pickup-weir below Mhaswad Canal No. 2 was also suggested. A small pickup-weir to divert water from a Nulla in Vadgaou Budruk into Mutha Canal was suggested. Small pickup-weirs on Vithalwadi Nulla and Nāna Sankarshet Nulla below Mutha right bank canal were constructed, and so much water was saved. I recommend that pickup-weirs, wherever possible, may be constructed on the system of Khāndesh Class II Irrigation Works. The works can be entrusted to village communities, and the maintenance charges would be small. I now suggest a pickup-weir on the Mula Mutha River. There is already a weir constructed for the Bund Garden, and it can be utilized for making a left bank canal from the weir.

2. I also recommend the construction of small tanks, not so much for irrigation direct but for feeding wells, by increasing the underground supply. I was in charge of the Islampur water-supply tank. In addition to the direct use it serves, it has made the supply of wells below it unfailing, and people are greatly benefited. I recommend, therefore, that small tanks, wherever possible, be constructed, as they will give useful work for famine labour near the homes of famine-stricken people, and be a permanent benefit to the country.

3. My experience is that the sufficiency of water in the Krishna canal largely depends on the rainfall at Mahābalashwar. Whenever there is 300 inches or more of rainfall there the supply is ample, but when it is less the supply is proportionately reduced. A storage tank, therefore, will improve the prospects of the canal which are already good.

(7) MR. NARAYAN VENKATESH CHANDAVARKAR, Māmlatdār of Bādāmi, Bijāpur District.

Answers to printed questions.

I

A.—GENERAL.

1. The following answers refer to Bijāpur district and I have answered them from my experience as a Māmlatdār.

2. The average rainfall in each month of the years 1900 and 1901 is given in the following statement:—

Statement showing the average rainfall in each month of the years 1900 and 1901, Tāluka Bādāmi, District Bijāpur.

Years.	January.	February.	March.	April.	May.	June.	July.
1900 . . .	0·0	0·0	0·0	0·60	1·73	3·48	2·61
1901 . . .	0·02	2·08	0·15	0·77	2·57	3·01	0·58

Years.	August.	September.	October.	November.	December.	TOTAL.
1900 . . .	1·34	4·96	2·67	0·0	0·0	17·39
1901 . . .	0·73	9·78	2·97	...	...	...

3. There is obstacle to the extension of irrigation arising from—

- (3) insufficient supply of manure. The only manure now used is of cowdung. The ryots are not allowed to get leaves from forests, besides there are no trees in the forests, the leaves of which can be used;
- (4) unsuitability of soil (black cotton soil) to irrigation, as the water of the tanks in such soil is likely to soak in;
- (5) uncertainty of the supply of water as the rainfall is very uncertain, and besides this, there is no certainty of finding water in the wells, if dug out. The water is found in a well to a

depth of from 40 to 60 feet, and much expense and labour to get the water for irrigation is required;

- (6) lack of capital for the initial expenditure or of funds for the more expensive cultivation of irrigated crops. There are very few among cultivating class in a position to spend a large amount for this purpose. The other well-to-do persons outlay their capital on interest, etc.

There is no obstacle arising from (2) insufficient supply of cattle suited to the cultivation of irrigated land as they can be got in the district;

- (7) fear of enhanced rent or revenue assessment. Generally no amount is spent by the tenant on the lands belonging to the owners. The owners of the lands get a fair amount of produce from the lands irrigated to pay off the assessment even if enhanced.

- (8) uncertainty of tenure. Up to the passing of the Land Revenue Code Amendment Act the occupants of lands did not think of the uncertainty of tenure as they knew that the lands were allowed to continue in their possession for ever, although the assessment is liable to be altered after a period of 30 years; but I think the occupants would hesitate to spend on this account, as there is no guarantee under the Land Revenue Code Amendment Act that the lands once forfeited would be restored to them without fail and to no one else.

4. No enhanced assessment for lands irrigated subsequent to the original Survey Settlement is levied up to the expiration of the term of Settlement (30 years). Generally no tenants spend anything at their own cost for lands leased to them by the owners. The existing provisions in respect of assessment are not sufficiently liberal. I would respectfully suggest that if the lands not formerly irrigated are once assessed, they should not be liable to any enhanced assessment if they are irrigated at the cost of the occupants.

5. Loans under the Land Improvement Act are not freely taken by the people for the extension of irrigation, as there is no certainty of water being found in wells and generally the black soil is not suited for tanks and the rainfall is uncertain.

- (1) The reduction of the rate of interest and (2) remission of the interest would not encourage the ryots to obtain

Mr.
Gokhale. Mr. B. P.
Milsom.

Mr.
Chandavarkar.

Mr.
Chandavar-
kar.

tagái loans for such purposes. (3) Partial remission of the advance and also (5) extension of the period of repayment (both in one and the same case) and (4) total remission in case of failure would, to some extent, encourage the ryots to obtain loans.

6. It is true that the ryots are sure and certain that they would get a fair portion of produce in the fields to be irrigated even if there is no rain. Still I do not think that the extension of irrigation would tend to injure the remaining cultivation by attracting its cultivators to the irrigated tracts.

The rainfall in this district is very uncertain and there are very few wells or tanks having natural springs, and the water-supply is thereby scanty and consequently the people desire to have means of irrigation extended at the cost of Government.

I would further suggest for encouraging the ryots to obtain *tagái* loans that if lands are forfeited under the Land Revenue Code Amendment Act, there should be a guarantee that they should be restored to the owners of the land without fail and to no one else.

D.—TANKS.

23. There are some tanks in the Bádami Táluka; the names are given below:—

- (1) (a) Hale Máhákoote Houd in Gowanki village.
- (b) Arakeri in Nilgund village.
- (c) Banashankri Houda in the village of Chalachgud.
- These tanks have natural springs of water.
- (d) 1. Dodakeri } in the village of Tim-
2. Sannakeri } ságar.
- (e) 1. Irawakeri } in Khánápur village.
2. Ganjikeri }
- (f) Tank in the village of Kendur.

These tanks are filled up with water during monsoon, but have no natural springs.

- (2) Government have fixed certain rules for regulating the water-supply that each *khátedár* should take a certain quantity of water for a certain period.
- (3) The tanks which have natural springs of water supply water to the lands under their command all round the year in a year of ample rainfall, in a year of scanty rainfall and also in a year of drought.

The tanks in the villages of Khánápur and Kendur supply water for a period of nine months in a year of ample rainfall, four months in a year of scanty rainfall, and in a year of drought the water is not sufficient even for one harvest.

The tanks in the village of Timságar supply water for a period of nearly four months only in a year of ample rainfall.

- (4) The area irrigated from each of the tanks is given below:—

	Area.		Assessment.	
	A.	G.	Rs.	a. p.
(a) Hale Mahakoote Houd	14	16	98	0 6
(b) Nilgund Arkeri	3	15	11	1 0
(c) Chalachgud Banashankri Houd	40	14	295	12 0
(d) Timságar—				
Dodakeri	72	14	295	12 0
Sannakeri	34	33	91	9 11
(e) Khánápur—				
Iranakeri	82	2	383	9 0
Ganjikeri	44	19	136	0 0
(f) Kendurkeri	256	16	1,436	13 6

26. The irrigation is not ordinarily supplemented by irrigation from wells given to the same land.

28. (1) There are no canals owned by private persons.

(2) The average annual rate per acre paid on account of irrigation to the owner of the land by the tenant is double the produce generally to be got in fields not irrigated.

(3) Generally the highest rate per acre for Khuski land is Rs. 1-4-0. It will be seen at what rate the owners of the lands are required to pay to Government in the form of enhancement of revenue, etc., from the amount of assessment given against the area irrigated and shown in paragraph 23 (4).

29. When lands are leased out to a tenant, it is generally decided that the tenant should spend any amount that would be required to bring the water to the field or to prepare that land for irrigation. The expenditure in this connection is very small, as no channels to flow water are constructed with stones, etc. This sort of labour is taken into consideration in fixing the amount of rent.

30. The maintenance is generally done by the Public Works Department. The approximate amount of cost per acre irrigated cannot be given, as there are no records. Every year such repairs, etc., are not executed by the Public Works Department.

31. There are no tanks constructed by private persons in this district.

32. I do not consider it advisable to encourage and assist the construction by private persons of further tanks, as there is no certainty of water being found, and the ryots would not undertake to construct such big works.

E.—WELLS.

34. (1) The average depth of permanent wells is from 40 to 60 feet.

(2) There are very few wells having natural springs in this part of the district. The water, if found in a well, is brackish and is not at all suitable for irrigation.

(3) The average cost of construction is from Rs. 1,000 to Rs. 4,000.

(4) The average duration of a well is for a period of 20 or 25 years. Subsequently the construction work will have to be repaired.

(5) The water is generally raised by the assistance of cattle. A leather bag containing some 4 or 5 gallons of water is prepared instead of *ghada* and is used for drawing water from the wells.

(6) and (7) The average area irrigated is nearly 8 acres at the utmost.

37. The average annual rate per acre paid on account of irrigation is Rs. 2-8-0 on account of gardens by the owner to Government, and Rs. 10 to the owner by the tenant. No paddy or jowári crops, etc., are raised here by irrigation from wells. The only produce which is raised by the use of water from wells is vegetables and sugarcane, etc.

(2) Nothing is paid to Government by the owner in the shape of enhancement of revenue if wells are dug out after the original Survey Settlement is introduced till the settlement period is over.

These rates are paid on the area actually irrigated by the tenants to the owners and by the owners to Government on the total area commanded by the well.

38. Serious difficulties are often encountered in the selection of spots in which a supply of water will be found; but none in the actual construction of the wells. I have not seen any instances in which assistance was offered by Government or local bodies in the shape of expert advice. In some places there are experts who select sites where water can be found, and their advice is generally acted up. It is advisable to have a supply of boring tools in the centre of a district or in some convenient place for the use of the ryots of two or three tálukas. The ryots who desire to make use of them should be given them free of charge.

39. I am not in favour of the construction by Government of wells in land which is private property. To irrigate lands from the use of water from wells requires a large expenditure constantly to be incurred. This is not possible for most of the ryots to incur, and consequently the ryots would not like to have them in their fields.

40. The temporary wells are not used in this part of the district, and in a year of scanty rainfall they will be of no use for irrigation purposes.

It is most difficult to find out water in temporary wells sufficient even for drinking purposes.

II.

3. If small tanks be constructed in hard black soil and not in soft black soil, water will hold in them, as water in such soil does not generally submerge; but earthen dams without masonry core will be of no use, as black soil is

easily washed away by heavy fall of rain. There is no demand for water during seasons of average rainfall, but only in case of prolonged drought; but in cases of gardens, even in rainy season, there is always demand for water. The red soil requires constant rain or water from tanks, but in the case of black soil—if there has been once sufficient moisture to a depth of one and a half feet—no water from tank is required.

There are two tanks which irrigate black soil in the village of Timesgar, but no water-rate is levied, as the use of water was taken into consideration when fixing the assessment on lands to be irrigated, and therefore it cannot be said that the irrigated area shows a falling-off in years of good rainfall and the revenue is precarious.

In this district the rainfall is very uncertain, and consequently the owners of black soil would like irrigation works, and the construction of irrigation tanks for black soil is considered as remunerative as the crops in black soil grow more than those in red soil, and the produce such as rabi, jowari, cotton, etc., is sold at a higher rate than that in red soil.

7. I doubt very much whether the ryots would like to construct new wells by the use of *tagdi* advances for irrigating their fields, as wells require a very large amount in

this part of the district; besides it is not certain that they would succeed in getting water. Only few ryots who are well-to-do would like to construct wells safely for the purpose of gardens.

There are some wells in some villages of this taluka, the water of which is safely used for gardens. There was no scarcity of water in these wells during famine years of 1899–1901.

During the years 1899–1901 small sums of Rs. 75 and Rs. 90 were granted for deepening the wells, and the owners of the wells got a fair quantity of water.

Generally water in wells is found to a depth of 50 to 60 feet, and to dig out a well that would irrigate some 8 acres would require from Rs. 2,000 to Rs. 4,000.

8. In this taluka there are no instances in which lands or crops are injured by water-logging, and no drainage works are required.

10. I have no remark to offer.

14. No irrigation works were constructed during the famine of 1897 and subsequently. The famine relief was found necessary in the form of employment on relief works for those who can work, and of gratuitous relief for those who are unable to do any sort of work.

Mr.
Chandana-
kar.

(8) MR. R. M. KENNEDY, I.C.S., Acting Commissioner, Southern Division.

Memorandum by Witness.

As the Commission has now arrived in the Southern Division, I have the honour to submit a short note on the needs of this division.

2. As I have received charge in the middle of November after an absence from India of 18 months, I am unable to speak from personal experience.

3. *Belgaum District.*—The areas liable to famine here are—

The Athni taluka, the Gokak taluka excepting the portion under Canal Irrigation, and the Parasgad taluka including the Murgod Petha.

To irrigate the above areas as a protective measure I would suggest as follows—

(1) The present *Gokak Canal* may be extended towards Athni to meet the Krishna river to the north, and (2) a canal may be constructed from the Krishna so as to serve the eastern and northern villages of Athni.

Bijapur District.—The whole of the district is liable to drought. The following works are suggested.

The *Sangogi tank* under construction may be completed which will serve parts of the Indi and Sindgi talukas.

For Indi and Sindgi talukas (in part).

For Bagawadi taluka (in part).

For parts of Bilgi Petha, Bijapur, Bagewadi, Bagalkot and Muddebihal talukas.

For Bidadri, Hingund and Bagalkot talukas in part.

A canal may be constructed from the Malaprabha river in the Nargund Petha of the Dhárwár district.

Dhárwár District.—The major portion of this district is ordinarily immune from famine. The parts liable are the Navalgund taluka including the Nargund Petha, the Gadag taluka including the Mundargi Petha and the Ron

taluka. A canal constructed from the Malaprabha river in the Nargund Petha will serve the Petha itself, and parts of the Navalgund and Ron talukas.

I would recommend also the *putting in thorough repair of all the existing tanks* in this district.

I have italicised the works I consider most necessary.

4. Unless it is known what sums can be made available both in lump and annually it is impossible to recommend definite proposals. Moreover, I am not aware that any definite schemes have been prepared except that for Sangogi tank.

5. On the Sangogi tank Rs. 2,44,000 have been expended. The estimate provides for an expenditure of 12 lakhs.

6. Personally I would advocate canal irrigation in preference to tank irrigation. It is true that generally there is some rain, though owing to its being unseasonable there is scarcity, but scarcity is generally accompanied by drought and in the Bijapur district the total rainfall is often very insufficient. Under these circumstances tanks may fail when they are most wanted. Rivers, however, being dependent on the rainfall at the watershed where rain is almost always plentiful are not liable to depletion.

7. Unfortunately the soil of most of the affected area is black soil which, as far as I have observed, is less suitable for irrigation purposes.

8. Canal irrigation is, however, successful in the neighbouring Satara district (in the case of the Krishna Canal), and I am hopeful of good results in the Athni and Gokak talukas of Belgaum.

9. I doubt, however, the success of irrigation works financially. The existing water-rates cannot, I fear, bear enhancement and to enhance them would tend to make them unpopular. They would not, however, cause much loss ultimately, and that loss would be more than covered by the increased prosperity of the people by partial protection from recurrent famine.

Mr. R. M.
Kennedy.

(9) MR. G. L. MACGREGOR, I.C.S., Assistant Collector, Kanara.

Answers to printed questions.

1. (i) To the whole of North Kanara.

(ii) I have had one year's tour in each division.

3. (1) The population is very sparse indeed except on the coast and on the Dhárwár-Mysore border.

(2) The cattle are of a very small breed. Where "waingan" rice is grown in heavy soil they use buffaloes. In these cases the land is flooded and then ploughed while under water.

(8) Leaf manure is plentiful; owing to the comparatively small number of cattle, rich phosphates are not obtainable for any increase of cultivation.

(4) The soil is sufficiently suitable.

(5) The south-west monsoon is the only real rainy season; a few heavy showers, however, fall in late April and early May. The rainy months are June to September. Latterly there has been a failure of rain in September.

(6) All the cultivators are poor. The capitalists are few and none of them take the smallest interest in the improvement of agriculture. I do not think expense is any drawback. I fancy there are few more expensive cultivations than garden crops, and everybody is ready and anxious to turn his riceland into garden.

(7) I have not heard of such fear.

Mr. G. L.
MacGregor.

Mr. G. L.
MacGregor.

(8) The tenant law and tenure are all right.

(9) The main objection to the extension of irrigation is the extent of jungle. Very nearly all available land—except in the malarious strip near the west of the ghats is under cultivation and most of it under rice, an irrigated crop. The soil is not, I think, rich enough to grow anything else. On the stony hills "ragi" is sometimes grown, but such land would not be suitable to irrigation and ragi is a dry crop.

I—BELOW GHATS.

5. Loans are generally taken by the people who live on the coast and principally for excluding water from their lands. A few wells are sunk with the help of *tagái* in the larger towns for the growth of mango, jack, and cocoanut trees in the gardens of the larger houses.

Tagái disbursed does not exceed Rs. 20,000 a year if it reaches that figure. The reasons are—

- (i) The ignorance and backwardness of the people which prevents their doing anything which their forefathers did not do.
- (ii) The natural water-supply is so extraordinarily good that irrigation is not in demand. The people draw and deflect the mountain streams on the coast at very little expense.

II—ABOVE GHATS.

In Haliyal and Mundgod the reasons irrigation is not extended are:—

- (i) The poverty of the people and the apathy of the *Sáwakar*.
- (ii) I do not think many other sites are available for tanks and there are no rivers to tap. I do not know the depth of the subsoil water from the surface of the ground.
- (iii) As a rule, in each village there is one tank which irrigates some of the lands, perhaps 30 acres on the average. These lands are in the hands of many holders. To improve the tank would benefit more than one holder and the cost more than a single holder will undertake. There are no philanthropists to undertake this work, and there is great difficulty in getting the people to take *takavi* on communal guarantee. I do not know if it has been tried extensively, but I know of one case on the coast where matters came to a deadlock. If you go to a Haliyal or Mundgod village, they will ask you to improve their tanks, but I do not think many villages will take *takavi* for it, as they seem to be under the impression that Government ought to do it. The Public Works Department if they have funds repair tanks where the people contribute $\frac{1}{2}$ of the cost, but it is difficult even to get them to do that much.

REMEDIES.

Nothing short of partial remission of the advance, say, 20 per cent., will be of any use.

6. There is so little artificial irrigation in this district that its effect is inappreciable. I should say no. The people who live in the village cling so tenaciously to their homes that they rarely go away even when the village is over-populated for the area under cultivation.

B 7.—There are no canals of continuous flow in North Kanara.

C 12.—This form of irrigation is confined to the hilly tracks.

(1) and (2). The dams are thrown across little mountain streams. A little trench is then dug which is led along the top of the field and the water is distributed on to the land from this by holes made in the banks.

(3) The supply is generally maintained, I believe, for about 3 or 4 months. Late rice is invariably grown with this water and is generally planted in December. When the rainfall is low as in 1899 no late rice is attempted to be grown. Actual drought is unknown.

13. (1) It is rarely that 2 crops are grown on the land. On the coast a second crop of vegetable is sometimes grown

in a patch, but not with irrigation and from streams but from holes sunk in the sand.

(2) Rice and sugarcane only are grown with irrigation.

(3) Rice only being grown, and as it will not grow without water, the yield is not appreciably increased.

14. When the rainfall is unfavourable the villagers do not attempt to grow any late crop rice. The monsoon is generally sufficient for the early crop.

15. The irrigation is not supplemented by wells.

16. I cannot give any estimate and I doubt if there is any increase.

17. There is no rate paid for irrigation from streams.

18. The annual expenditure is trifling, not more, I should say, than Rs. 10 for each stream which will irrigate 30 acres. The actual expense is *nil*, as the wood is applied free by the Forest Department and the only cost is the labour. This is generally borne by the tenant. He has no security and needs none.

19. I cannot answer this question.

20—22. These perhaps do not apply to this district.

D.—TANKS.

23. These are found in the east of Haliyal, Sirsi and Siddapur talukas and the Mundgod Petha.

(1) The tank is generally the head of a slight depression in the ground which is banded up. The catchment area is only a few acres.

(2) The bund has a sluice from which the water is distributed over the uppermost levels; it flows down to the lower stretches from holes in the terraces.

(3) (a) In a year of ample rainfall the supply is maintained till the middle of April. Some of the larger tanks never dry up.

(b) When the rainfall is scanty the tanks dry up in February.

(c) An actual drought has never occurred.

(4) The area irrigated will vary from 10 to 100 acres.

24. (1) The tanks that I have seen do not last long enough to grow a second crop. I have never seen a second crop. I have not seen the Mavinkop tank.

(2) It increases the yield in a year of scanty rainfall only by admitting cultivation of the higher lands. I have never seen them in a year of drought or of ample rainfall.

25. I do not know about the too late commencement of the rain, which generally commences pretty regularly. Early cessation of the rainfall means that only the low-lying terraces get sufficient water, as the tank is only an assistance to the rainfall and much crop is grown above the reach of the tank-water.

26. No. When the tank runs dry pits are dug in the bed of it, but not for irrigational purposes.

27—29. I cannot answer these questions.

30. Nothing in the way of conservancy is due that I know of.

31. Private persons only construct little tanks to irrigate their own field or fields.

32. I do not think there are many available sites.

33. The tanks frequently get choked with silt and weeds. In the hot weather when the tank dries up the people very occasionally ask district officers to remove it. "Repairing a tank" generally consists of this. If the Patel, which is rarely the case, is an influential man, he persuades the villagers to do the work themselves.

E.—WELLS.

Wells are not used for irrigation except for the small palm and fruit gardens in the compounds of houses. Holes are occasionally dug in the beds of streams and water raised to the crop on the bank by means of a counterpoise. The average cost of construction is merely the labour involved, as all wood, etc., is supplied free. They are not in general use except on the coast.

(10) MR. H. B. SHOUBRIDGE, Acting Executive Engineer, Public Works Department.

Mr. H. I.
Shoubridge*Note on the extension of Irrigation from the Madag tank, Dharwar Collectorate, Bombay Presidency.*

The Madag tank is situated on the southern border of the Dharwar Collectorate of the Bombay Presidency and is in Mysore territory, the frontier passing over the centre of the tank dam.

Situation.—75°27' East, 14°21' North.

2. The dam was constructed, it is believed, some three centuries ago, but, apparently, shortly after its construction the low saddle between two hills which was apparently used as a waste-weir scoured out, rendering the dam, which is about 150 feet high and 1,300 feet bed width, practically useless.

3. The waters of this tank were not used till 1870-71. An outlet through the dam and also the right and left bank canals were constructed during the years 1861 to 1867.

4. Mr. Joyner in 1885 submitted three alternative projects for raising the water level of the tank by 54 feet, 49 feet and a slightly increased level than at present, respectively.

5. The first two projects are at present out of the question, as they would involve the submergence of 12,000 acres in Mysore or nearly a whole taluka, the compensation to be paid for acquiring this site would amount to between Rs. 18,00,000 and 14,00,000 and the Mysore Government have refused to part with the land. The only possible extension is, therefore, on the lines of the smallest project and the following information is in support of the advisability of a detailed survey being undertaken.

6. The discharges gauged in the river below the waste weir from the year 1869 to 1893 show that there is practically a continuous discharge of 100 cusecs available from June 20th till November 20th, in addition to the discharge drawn off by the existing canals, which may be roughly taken at 15 cusecs, during the above period, though at times the canals are closed when there is no demand for water.

7. Table showing records of 25 years gauging of 100 cusecs or over flowing to waste.

(Each month is divided into three periods of approximately ten days).

Month.	Period.	Number of years in which 100 cusecs or over have been recorded during whole period in 25 years.
June	1st	3
	2nd	8
	3rd	16
July	1st	20
	2nd	23
	3rd	25
August	1st	25
	2nd	25
	3rd	25
September	1st	25
	2nd	26
	3rd	25
October	1st	21
	2nd	22
	3rd	21
November	1st	20½
	2nd	19
	3rd	14
December	1st	8
	2nd	5½
	3rd	3½

8. The period of certain supply corresponds with the rice cultivation season, and *jawari* is also grown during this period, but requires water as late as the end of October, the supply in October being liable to curtailment in about three years out of 25.

9. The above is the case on the Dharma Canal situated near Hangal about 30 miles to the north-west, and this canal is situated in a wetter zone and cultivates nothing but rice, and a few garden (fruit trees, cocoanuts, etc.) lands. This canal is entirely successful, and is about 19 miles long excluding branches.

10. After the year 1893 till the present day the discharges have not been gauged, but records show that the waste weir has flowed continuously from 20th June till 31st December with only one break of ten days in November and in another year the whole of December.

11. The average discharges worked out from 1872-1884 are as follows :—

Month.	Average cusecs.	Maximum on one day.
May	20	322
June	270	6,651
July	2,023	44,619
August	1,338	8,752
September	804	5,731
October	666	4,948
November	353	4,947
December	70	358

12. The above averages are only for a period of 12 years, but they show that on the average, 250 cusecs may be relied on from 20th June till the end of November, and as rice does not require much water in the early stages of its growth in *this district* (no rice is transplanted), 250 cusecs may safely be relied upon as available for irrigation *without any storage whatever*, during the rice and *jawari* season.

13. The existing canals cultivate the lands near the village of Masur which has a fairly heavy rainfall. It is possible to take the water much further, however, to a far drier area and the attached tables and charts* illustrate this.

14. The months of heavy rainfall at Masur are June, July and October, whilst at Ranibenur the heavy falls may be expected only in October. Ranibenur is worst off during August, when there is the greatest amount of water available for irrigation. There is, therefore, a better chance of water being utilized regularly near Ranibenur than at Masur. The area at present cultivated near Masur by irrigation is about 800 acres, but there is a distinct tendency to increase this area in years of scanty rainfall, such as 1891 and 1899, in which the areas are the largest and the rainfall the least during the last ten years.

15. The rainfall at Hirekerur is given to show the rapid falling-off in rainfall outside the Masur Valley.

16. Hirekerur is only 7 miles to the north-west of Masur. The rainfall returns for Masur, Hirekerur and Ranibenur all show that there may be a *total failure* of rainfall during any month of the year. The months of June and July being least liable to failure. Any extension of irrigation would, therefore, be useful as protection against famine.

17. The left bank canal may be enlarged to carry 200 cusecs as a normal full supply discharge with a margin of 1 to 2 feet over this as possible maximum level and extended to near Ranibenur. The hydraulic gradient may be made 7·92" per mile which is two inches in excess of that of the Dharma Canal which gives no trouble from weeds or silt.

18. A survey to locate the line and for the preparation of the estimate is necessary.

19. The above proposals can all be carried out without any increase on the storage of the tank, but to allow for a possible shortage or break during the monsoon and to give an increased head to the Regulator at the head of the canal, it is desirable to approach the Mysore Government with a view to their permitting a modified form of Regulation: as indicated by the bar dotted line on the attached sheet* No. 3 showing curves of water level in the Madag Tank above weir-crest.

20. The waste-weir is already provided with piers and sills for planks, but the British Government have never been allowed to insert the planks.

Mr. H. B. Shoubridge. 21. The Regulation proposed cannot possibly harm to the lands that would be submerged, because they are liable to a submergence up till 15th November of as much as 5 feet and only 1' 6" is asked for on that date, after which only 8" provide water sufficient at

the 1st six miles of the left bank canal would be alone entitled to draw on the storage of the tank as long as the waste-weir was not flowing. The area under command is about 45,000 acres.

The proposal is well worth the serious consideration of Government, and there is no reason why it should not be as well as, if not better than, the Dharma Canal which it is shortly proposed to remodel to irrigate 12,000

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Table of rainfall from 1868 to 1901.

	MASUR.			HIRAKHUR.			BANIBENUR.		
	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.	Maximum.	Average.	Minimum.
May	10.3	2.88	..	7.9	2.26	...	7.5	2.75	...
June	10.1	4.58	.8	8.8	3.84	.8	5.8	2.88	.2
July	18.8	6.42	.6	16.9	5.89	1.1	6.9	3.24	.8
August	7.6	3.41	.3	10.3	3.14	.3	6.7	2.38	...
September	9.9	3.30	.2	7.7	2.63	.4	10.6	3.21	...
October	10.7	5.17	...	12.3	4.85	.5	14.7	5.26	.1
November	5.6	1.75	...	7.8	1.32	...	12.5	1.52	...
December	2.3	.25	...	4.3	.42	...	3.3	.30	...

(11) Minutes of a Conference held with the Hon'ble Mr. J. Monteath, C.S.I., I.C.S., Member of Council, Bombay, Poona, 30th December 1901.

PROVINCIALIZATION OF IRRIGATION WORKS.

Mr. J. Monteath. Sir Colin Moncrieff.—We should be glad, Mr. Monteath, if you would give us the benefit of your opinion on the question of provincializing the Irrigation Works of this Presidency.

Mr. Monteath.—At present the only Provincial Work is the Gokak Canal which was made in connection with a mill contract with a private company. The Secretary of State ordered it to be so classed. Generally the object of provincializing is to provide a check on expenditure, but it does not exist in this case, as everybody wants to extend irrigation. I see no objection to provincializing irrigation works, nor do I see much advantage. The receipts from these works in the Presidency proper are small and are chiefly recovered as land revenue; the direct receipts are very small; the accounts are complicated, and provincializing the works would save correspondence in this respect, and applications for sanction, etc. As to increasing the interest which the Local Government take in the works, I do not think that is possible.

Mr. Higham.—Might you not fund the receipt the minor works so as to provide means for their improvement?

Mr. Monteath.—Not very well in Bombay; there direct receipts from minor works. The water rev. consolidated in the land revenue.

Sir Colin Moncrieff.—Under the present arrangement the water rate is Imperial and the land revenue Provincial. Might not the Province be given the whole of the water share of the land revenue so as to increase its interest in the works?

Mr. Monteath.—If we get the water share—say four-fifths of the land revenue—it would perhaps result in the tanks being maintained in a more efficient state, but I doubt if there would be any increase in interest; our officers could not be more keen in the matter than they are at present.

MAINTENANCE OF TANKS AND SMALL IRRIGATION WORKS.

Mr. Higham.—If the Government of India were to give the money required for making small works, could the Local Government undertake their maintenance if it got credit for all the increased land revenue? At present it only gets one-fourth as its share.

Mr. Monteath.—I think the water share of the tanks would suffice to maintain the works. There as regards maintaining these small works, worth maintaining and might be handed over to keep up or not as they choose.

Mr. Higham.—Would you first put them in a more efficient state of repair?

Mr. Monteath.—Not those which are not worth repairing; I would leave that to the people and generally reduce the assessment on land under them to dry rates, but in some cases where the works are to utilize at no great cost a natural advantage of water, I would make some charge for the water. No charge should ordinarily be made in the case of small tanks made by private individuals.

Mr. Higham.—You say that there is no difficulty as regards maintaining the works, but in the case of the selected works which are to be maintained by Government, the Local Government will get only one-fourth of the land revenue, and if it spends money on repairing the works, its interest in the returns on the expenditure will be only one-fourth of the whole.

Mr. Monteath.—I meant that there would be no difficulty if we got the water share of the assessment, and I was speaking merely of the cost of maintenance. The Government of India would have to give the money required to put the works into a proper state in the first instance.

Mr. Ibbetson.—You said just now, Mr. Monteath, that

Mr. Monteath.—It depends on circumstances; there are cases in which the water advantage is exceedingly small and obtained at the cost of the cultivator, e.g., surface drainage caught by bunds; in such cases I would not charge. But I would not relinquish the charge altogether; I would, for instance, charge the people living on the bank of a running stream.

Mr. Ibbetson.—Even if the abolition of the charge would stimulate the use of the water?

Mr. Monteath.—It would hardly do that—the charge is small as compared with the advantage. In many cases on running streams where the water advantage is considerable it is reasonable to make a charge which would not be equitable to let them have an advantage over their neighbours. I would be exceedingly loath to stimulate the use of the water.

Mr. Higham.—What is your opinion, Mr. Monteath, regarding the 10 per cent. contribution which the Local Government must agree to before a tank is repaired? I think that the Public Works Office would be the difficulty arising from this rule, and that it would be exceedingly difficult to get the tanks repaired in groups.

Mr. Monteath.—The officers have advised that it should not be done, and the order of the Government is evidence